

FOREST STEWARDSHIP PLAN

For

City of Cumberland & Evitts Creek Water Company
57 N Liberty Street
Cumberland, MD 21502
301-759-6424

Location

Bedford County, PA
Surrounding Lakes Gordon and Koon, off of Route 220
Approximately 10 miles Northeast of Cumberland

GPS Coordinates

N 39.748249 W 78.674371

Watershed

Evitts Creek

On Approximately

3,623 +/- acres total

Including

3,552 +/- acres forest

70 +/- acres open areas

200 acres lakes

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This forest management plan was undertaken by a collection of interested partners, including The City of Cumberland (the owner of Evitts Creek Water Company), The Nature Conservancy, Maryland Department of Natural Resources Forest Service, Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry, Pennsylvania Natural Heritage Program, Allegany College of Maryland, and the Western Pennsylvania Conservancy. Funding for this plan was provided by a US Forest Service Grant.

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Statement of Purpose

The purpose of this forest management plan is to guide the sustainable management of forestland owned by the Evitts Creek Water Company (ECWCo), with the primary focus of maintaining or improving water quality and quantity in Lake Gordon and Lake Koon, the source of potable water for over 50,000 customers in Maryland, Pennsylvania, and West Virginia.

This forest management plan updates and replaces all previous management plans for the properties.

The development of this plan was undertaken by a collection of interested partners including the City of Cumberland, The Nature Conservancy, Maryland Department of Natural Resources, Pennsylvania Department of Conservation and Natural Resources, Allegany College of Maryland, and the Western Pennsylvania Conservancy. Funding for this plan was provided by a US Forest Service Grant.

Forest Management Goals

The following overarching management goals will drive the management decisions and investments on the ECWCo properties:

1. Preserve the water quality and quantity of the sources by maintaining or improving the capacity of the watershed to produce these values, and by maintaining or improving watershed ecological security to ensure the safety of the supply.
2. Maintain or improve the capacity of the properties to produce financial returns, which will enhance and protect the long-term value of the asset.
3. Promote ecosystem health and diversity as well as sustainable management of all resources through compliance with all federal, state, and municipal legal requirements; FSC standards of operation; and other best management practices (BMPs).
4. Maintain or improve opportunities for dispersed low-density outdoor recreation that are compatible with maintaining the integrity of the forest ecosystem and do not negatively impact water resources.
5. Meet all legal and regulatory requirements.

Forest Management Guiding Principles

1. In the absence of any specific directive, forest management will always be undertaken based on the best current science available regarding the maintenance of forest health within the watershed properties.
2. Prior to initiating any forest management activity on the properties, the State of Pennsylvania and Federal databases will be consulted to determine if any species of special concern or rare, threatened, or endangered species are located within the stand being considered for management. If one or more of the species is found to occur within the area of the forest being considered for management, the recommended management practices for that species will govern management. These restrictions may include: no management, no entry, seasonal limitations, or other active or passive practices or prohibitions.

3. Forest stands that have been partially or completely designated as High Value Conservation areas will have restrictions placed on management options within them. These specific restrictions will appear within this document.
4. Best management practices (BMPs) will always be followed as a component of any forest management activity. This restriction will apply to any road construction/maintenance issue as well as any harvest, recreation or cultural activity. The need for road improvement/maintenance will be determined prior to any management activity within a compartment. Contract provisions that include road improvement/maintenance are encouraged.
5. The "Forest Health Report Card" will help to determine the priority of management activities within stands on the properties.
 - A. Severely overstocked stands that contain an abundance of acceptable growing stock will be given priority for management activities. Thinning these stands to a biologically acceptable level should be scheduled.
 - B. Stands that are understocked and contain high percentages of unacceptable growing stock will be considered for overstory removal and regeneration. The size of the cuts should be restricted to a maximum size of 20-50 acres. Exceptions to this policy must be justified by the forest manager. The justification would need to cite specific forest health concerns.
 - C. Stands with a high percentage of Virginia pine should be considered for regeneration harvests. Reestablishment of Virginia Pine may or may not be considered a priority. The abundance of conifer cover within the compartment should help determine if pine regeneration is necessary or desirable. Because of the use of prescribed fire on the properties, pitch pine, table mountain pine, and shortleaf pine regeneration will be preferred.
 - D. White pine and Canadian hemlock should be considered for retention during any cultural operation because of the species' contribution to diversity and thermal protection of wildlife species.
 - E. Stands exhibiting a high degree of species diversity and age classes should be considered for a conversion to uneven-aged management.
 - F. Red oak (*Quercus rubra*) and sugar maple (*Acer saccharum*) should be the species considered as the most economically desirable species. Stand prescriptions should be chosen which will promote the regeneration and growth of these species.
 - G. Mature stands with large percentages of desirable regeneration should be scheduled for stand regeneration.
 - H. Deer population densities should be a consideration when planning forest management activities. The forest manager should consider the use of deer fencing or encouraging the increase of hunting pressure by improving access prior to scheduling management.
6. Water quality, forest health, and economic return will be given top priority when planning management activities within the properties. Secondary consideration will be given to practices which have the potential to improve consumptive recreational activities such as hunting and fishing. Other forms of recreation are viable activities within the

watershed properties and can be improved through management as long as the recreational activities do not impact long-term sustainability of the forest.

7. Very limited entry of machinery within the 100-foot buffer zone of the lake and within the 50 foot buffer of the water courses (the inner streamside management zones) within the properties will be permitted. Exceptions to this policy must be justified by the forest manager. The justification would need to cite specific forest health concerns within the buffers.
8. The outer zones of the streamside management zones (200 feet outside of the inner zone around water supply lakes and 100 feet outside of the inner zone around other water courses) could be considered for partial tree removal, but a basal area of at least 60 square feet per acre must always be maintained within this zone, and machine entry should be limited and justified.
9. Standing dead trees (snags) should be maintained during any cultural activity within the forest except in areas where recreational activity is prominent (lakeside zone, along trails). The benefit of these trees for wildlife species dictates that from 5 to 10 trees per acre be retained.
10. The ecological significance of vernal pools mandates that every effort be taken to identify their presence and avoid disturbance during cultural/management activities on the entire property.
11. Forest management on slopes greater than 40% (22° angle) should be avoided. Recreation activity on these steep slopes is allowed but not encouraged.
12. The presence of invasive species should be ascertained prior to any stand management activities and treatment of these species should be initiated when economically possible.
13. Abundance of desirable regeneration should be monitored prior to undertaking management activities and re-evaluated five years following any cultural activity.
14. The age class distribution within the ECWCo properties should be balanced so that the impact of catastrophic events such as fire, wind storms, or insect outbreaks might be minimized.
15. Properties boundaries should be maintained. All markings should be renewed on a 10-year cycle.
16. The Evitts Creek Steering Committee, which meets quarterly, will be consulted for guidance concerning any management activities that will take place within the watershed. Annual reports will be made to the committee by the forest manager or a designee.

Certification and Working Woodlands

The ECWCo will seek certification for their forest management plan under the Forest Stewardship Council (FSC) US 2010 National Standard as part of The Nature Conservancy's (TNC) group certificate. Once certified, the properties will be enrolled in Working Woodlands, TNC's private forest landowner program. The vision for Working Woodlands is to restore and sustain high quality ecological values within economically productive forests. This forest management plan will be periodically reviewed and updated to ensure compliance with FSC US National Standard and TNC's Group Certification program..

General Properties Description

Legal Description

The ECWCo properties is comprised of 2 tracts, totaling approximately 3,623 of mostly forested acreage. The tracts lie within Cumberland Valley Township in southwestern Bedford County, Pennsylvania. The majority of the properties (3,390 acres) surrounds Lake Gordon and Lake Koon, which are man-made reservoirs. The remaining acreage (approximately 400 acres) makes up an outparcel of land that is divided by Evitts Creek (See appendix, maps).

Topography

Elevations on the properties range from 900 feet to approximately 1,700 feet above sea level. There are a mixture of gentle slopes (0 - 20%) and steep slopes (20-40%) throughout the properties. The steepest slopes on the properties occur on Shriver Ridge, which is situated parallel to the reservoirs (Lake Gordon and Lake Koon) and Route 220. Along the shore of Lake Koon near the boat access, there are slopes that are excessively steep (60% to over 100% slope) and appear very "cliff - like". There are places that are fairly flat along the runs and creeks on the property, but have large cobbles just under the surface of the soil. Some streams and runs are in stable channels while other runs and creeks are extremely excised and eroded from the original bank level.

Roads

There are approximately 10 miles of public roads (township and state) that traverse the ECWCo properties. Most of the roads are either asphalt or tar and chip - only 3% of the public roads are graveled (Chimney Ridge). There are 6 private/restricted roads, including Tea Cup Lane, that are used for access to adjoining properties. One of these roads, located near the bridge spanning Koon Dam, is seasonally opened to access the PA Bureau of Forestry's properties on the east side of Evitts Creek Road.

Cumberland Valley Township is involved with Pennsylvania's Dirt and Gravel Road program. This program assists the local jurisdiction in the management of dirt and gravel roads. Chimney Ridge Road is being considered for involvement in the dirt and gravel program. There is a ford crossing on the road section above the properties that could be a source of future water quality issues if it is not addressed.

Refer to the Soils Management section for more information on roads management on the ECWCo properties.

Regional Context

Adjacent Landownership and Surrounding Area

Most of the adjoining properties are privately-owned small acreages. Many are used as hunting or summer vacation cabins. Some of the cabins have been upgraded to year-round homes, while others have been torn down and replaced with modern homes. A few farms exist on the north side of the properties. The DCNR Bureau of Forestry owns the public properties that adjoins the ECWCo on the east side.

To the north of the properties are Bedford, PA and the PA Turnpike, a major east/west connector. To the east is Evitts Mountain, which stretches from near Everett and Bedford, PA to just below the state boundary in Maryland at Rocky Gap State Park. To the west is US 220, The Appalachian Thruway, which is an important north/south highway in this region. To the south is Interstate 68, an east/west route that runs parallel to the Turnpike through the three western counties in Maryland. Also to the south is Rocky Gap State Park, which is in the Evitts Creek watershed as well, but joins below the ECWCo properties. Rocky Gap State Park is home to Lake Habeeb, a recreational reservoir that was constructed on Rocky Gap Run.

Socio-economic Setting

Bedford County consists of 1,017 square miles (650,880 acres) of land area. There are 25 townships and 13 boroughs, with a total county population of 49,055 (US Census, 2013). Overall population trends for the surrounding region are mixed: cities and towns along the Interstate 81 corridor, including Hagerstown (MD), Winchester (VA), and Martinsburg (WV), are seeing growth because of I-81's use as a north/south transportation corridor that parallels Interstate 95. Conversely, cities such as Cumberland (MD), Altoona (PA), and Covington (VA) have experienced population declines.

The economic sectors employing the most people in Bedford County are retail trades, transportation, and warehousing. Manufacturing is still important in the county, with metal fabrication plants, as well as sawmills and other forest product industries, contributing significantly to the local economy. A list of regional wood products markets is included in the appendix.

Recreational opportunities are abundant in the county, including three state parks, several PA Game Commission land holdings, and the Buchanan State Forest. These recreation areas are open to hiking, hunting, and/or camping. In 2007, historic Bedford Springs Resort was refurbished and reopened to guests. Raystown Lake, a U.S. Army Corps of Engineers water control reservoir in the northeast corner of the county, attracts many people interested in fishing and other water sports. There are also opportunities for recreation in Allegany County, Maryland including Rocky Gap State Park, which is not far from Lake Gordon and Lake Koon.

Physiographic Province

The ECWCo properties are part of the Appalachian Mountain section of the Ridge and Valley Physiographic Province. The dominant topographic form in this section consists of long, narrow ridges and broad to narrow valleys, some of which are karst. The local relief in this section is moderate to very high, with elevations ranging from 440-2,775 feet.

Eco-regional Description

The ECWCo properties lies in the Northern Ridge and Valley/Central Appalachians ecoregion. The Northern Ridge and Valley/Central Appalachians ecoregion stretches from northeastern Pennsylvania to southwestern Virginia. The eastern boundary is defined by the Blue Ridge ecoregion and to the west are the Allegheny and Cumberland plateaus. The region is

characterized by a series of parallel valleys and ridge lines that lie in a southwest to northeast orientation. Elevations range between 400 and 4,300 feet.

The underlining geology of the ecoregion includes sandstone, shale, limestone, and dolomite rock types. Ridges tend to be sandstone, while the valleys tend to be derived from limestone/dolomite or shale. Limestone based soils are very fertile, while shale soils tend to be not as productive (unless they are calcareous).

Lake Gordon/Koon is in an area of transition from the Appalachian Oak Forest type (dominants include white oak and northern red oak) to Oak-Hickory-Pine type (dominants include hickory, shortleaf pine, and white oak).

Watershed Description

The ECWCo properties (and reservoirs) are located within the Evitts Creek Watershed, the area of which covers approximately 30.6 square miles (19,600 acres) in Allegany County, MD and 62.2 square miles (39,800 acres) in Bedford County, PA. The portion of Evitts Creek watershed that drains into the reservoir lakes is approximately 50.8 square miles (32,512 acres) in size. The land cover in the watershed is mixed, with forests making up the majority. Agriculture (crops and pasture) is the second most common land cover, accounting for approximately 14% of the watershed area.

Potential sources of pollution that could affect the reservoir lakes on the ECWCo properties include agricultural practices (from crops and pasture), discharges from 2 municipal point source facilities; spills and runoff from roads, especially Route 220; timber harvest operations; and existing and future development in the watershed. These pollution sources can contribute nutrient enrichment, sedimentation, and contamination by pathogenic organisms to the reservoirs.

The Evitts Creek Watershed is located in the North Branch of the Potomac River Watershed, which is 499 square miles (319,360 acres) in size and drains parts of MD, PA, and WV. The confluence of Evitts Creek and the North Branch of the Potomac River is located 2 miles southeast of Cumberland, MD. From there, the North Branch joins the South Branch of the Potomac River and flows to the Chesapeake Bay. (See appendix, maps)

Ownership

The properties for which this plan is written are owned by ECWCo, a non-profit corporation in the Commonwealth of Pennsylvania. ECWCo is controlled by three shareholders, whom are appointed by the Mayor and City Council. The Mayor of Cumberland is the president of the board and holds 98 shares in the corporation, while the treasurer and the secretary each hold 1 share. The treasurer is a City of Cumberland councilperson and the secretary is the City Engineer. In this way, the City of Cumberland controls the ECWCo. Thus, the staff and financial resources for management of this properties are provided by the City.

See the appendix for the list of applicable laws and regulations.

ECWCo owns the properties (fee simple) and all related rights (mineral, timber, etc.). However, there are several easements on the properties:

- 1 easement for fiber optic cable that runs from Pine Ridge Road to Evitts Creek at the water filter plant,
- 2 easements for electric/telephone lines that relay utilities to neighboring properties,
- 6 road-access easements from public roads to the adjoining properties,
- 1 easement, 10-feet-wide, for a private waterline, which originates at the water line servicing residents off of Lake Dam Road, and
- 2 easements for waterlines that run south from the water plant, cross the ECWCo properties, follow Evitts Creek, and ultimately deliver water to Cumberland.

Community Relations

The City of Cumberland's water system, with Lake Gordon and Koon as its source of supply, provides the lifeblood of quality drinking water to over 50,000 residential, commercial, and industrial customers within the City and communities in the surrounding tri-state area. This significantly enhances the social and economic vitality of the entire region. Additionally, the City of Cumberland and the ECWCo employ local people and procure from local businesses the materials, supplies, and services that are required to maintain the properties.

The public is made aware of activity on the properties through Public Works Department monthly reports to the Mayor and City Council and quarterly reports to the Evitts Creek Steering Committee. The bi-monthly meetings of the Mayor and City Council and the quarterly meetings of the Evitts Creek Steering Committee offer the public chances to comment and voice concerns about activities on the properties. Moreover, the City of Cumberland communicates with the many water companies and water authorities that supply their customers with water received from the Evitts Creek Water Company.

A multitude of stakeholders exist throughout the Evitts Creek watershed. They use, value, and impact forest and water resources at varying levels. These groups include:

- Cumberland Valley Township, which plays a role in land and infrastructure planning within Bedford County
- Bedford County, which implements and enforces erosion and sediment control regulations and conducts comprehensive land and open space planning
- The Pennsylvania Department of Conservation and Natural Resources (DCNR), which provides forest management guidance and manages the state properties that borders ECWCo properties
- The Pennsylvania Fish and Boat Commission (PFBC), which provides enforcement and manages watercraft regulations and fisheries resources
- The Pennsylvania Game Commission (PGC), which provides enforcement and manages wildlife resources
- The Pennsylvania Department of Environmental Protection (DEP), which regulates various activities in wetlands and waters and provides funding for non-point source pollution reduction

- The Pennsylvania Department of Transportation (PennDOT), which maintains a federal highway within the watershed (US 220)
- Woodland Owners of the Southern Alleghenies, which represents local forest landowners
- Allegany College of Maryland, which is supplied with water by the ECWCo and is represented on the Evitts Creek Steering Committee
- Allegany County, which relies on water supplied by ECWCo for the communities of Lower LaVale, Bowman's Addition, Mexico Farms, and Bowling Green
- Mineral County, West Virginia which relies on water supplied by ECWCo for the communities of Ridgeley and Carbondale
- Maryland Department of the Environment (MDE), which regulates source water for consumption in Maryland

Public Access for Hunting & Fishing, and Other Recreation

The ECWCo allows public access to its lands for fishing and hunting. Non-motorized boats are allowed on the lakes, but all boats must be registered with the Pennsylvania Fish and Game Commission. Gas-powered motors are not permitted on the lakes. Parking areas and boat ramps are maintained cooperatively between the PA Fish and Boat Commission and the ECWCo. Other types of non-motorized recreation are permitted on the properties, but infrastructure (such as a maintained trail system) is not present. The properties are patrolled by conservation officers from Pennsylvania Fish and Boat Commission as well as the Pennsylvania Game Commission. Additional law enforcement is available from the PA State Police office in Everett, PA and the Bureau of Forestry/Buchanan State Forest.

History: Cumberland and its Water Supply System¹

In 1910, the City of Cumberland was getting their water supply via a pump station and water plant located on the North Branch Potomac River near the confluence with Wills Creek. Due to concerns about increasing water pollution and disease (Typhoid fever, most notably), the Mayor and City Council tasked a committee (The Water Supply Advisory Committee; Robert H. Gordon, Chair) to investigate alternative sources for a clean water supply. The Water Supply Advisory Committee reported back to the Mayor and City Council with their findings and recommended that a location 10 miles north of Cumberland, in Cumberland Valley Township, Bedford County, Pennsylvania, was a desirable site on which to create new water supply reservoirs.

¹ Much of the information in the History section is from the Mountain Discoveries article, “Cumberland’s Century Celebration of Lake Gordon.” <http://www.mountaindiscoveries.com/images/ss2014/03dam.pdf>



Figure 1: Lake Gordon Dam Construction 1912

Once the decision of where to locate the reservoirs was finalized, although not easily, as the decision was considered oppositional by many, the Committee sent individuals, representing both the City and the Committee, to Harrisburg. There, they secured a charter from the State Water Commissioners for the Evitts Creek Water Company (ECWCo) of Bedford, PA. The charter was granted, and The Evitts Creek Water Company (ECWCo) was set up as a Pennsylvanian corporation controlled by the City of Cumberland in 1911.

Initial purchases of properties on which to create the first lake (Lake Gordon) and the water plant were made between 1909 and 1910 pre-emptively by a local lawyer, Finley Hendrickson. Mr. Hendrickson acted alone and wished to secure land for the city before talk of the proposed project inflated land prices. Although Mr. Hendrickson did not request any profit from the city for his work in purchasing the properties, the city did provide him compensation for his services. Additionally, the ECWCo signed a Resolution of Respect in Mr. Hendrickson's memory upon his death in 1940.

Forests were cleared in the immediate area of the planned lake and water plant, and buildings that were on the properties when it was purchased were mostly razed, with only the foundations left standing. (Figure 1). The work took nearly 2 years and cost hundreds of thousands of dollars. The water plant and first lake were completed on September 15, 1913. The lake was named after Robert H. Gordon, a Cumberland attorney who was an avid proponent and campaigner for the use of Evitts Creek for the city's water supply.

The water provided by Lake Gordon and the water plant was seen as a blessing, especially because the number of waterborne illnesses in the city began to sharply decline. Cumberland's population continued to grow and, beginning in the 1920's, ECWCo found that the demand for water was increasing beyond Lake Gordon's supply potential, generating a need for a means to maintain a constant lake level. Creating additional lakes seemed like a viable solution. So, in the 1920's and 30's, properties were purchased and land was cleared to create Lake Koon (named after Thomas Koon, who was mayor at the time of the construction of the second dam and member of the Water Supply Advisory Committee). Unfortunately, a covered bridge over Evitts Creek had to be removed and a church and its graveyard had to be relocated in order for

the Lake Koon development plans to come to fruition. Nonetheless, the Lake Koon impoundment was dedicated in 1932 with representatives from the offices of the governors of Maryland and Pennsylvania present, along with local elected officials from both the City of Cumberland and Bedford County. A third impoundment was considered and the parcels for it were purchased in the 1960's and 1970's; however, the third lake was never developed.

It is thought that when the first humans arrived to Pennsylvania, nearly 12,000 years ago, the area was covered with forests of spruce, fir, birch, pine, and alder. At the time, the climate was cool and wet, but the climate slowly got warmer over the next few thousand years. This led to oak, chestnut, hickory, and beech trees moving into the forests from the south. From 8,000 to 1,000 years ago, people started using fire to remove forests for villages and to clear underbrush in the forest, which improved forest conditions for hunting.²

Beginning as far back as the 1750's, when the area was formally settled by Europeans, the properties have been subject to many timber harvests. Settlers cleared the forests so that the land could be used for growing crops (corn and wheat) and grazing livestock (cattle and sheep). Furthermore, iron forges, tanneries, and sawmills in the region created a demand for American chestnut, hemlock, and oak, which were common species in the Evitts Creek watershed at the time of settlement.

Many trees were cut down during construction of Lake Gordon. Men used axes, two-man saws, and horse-drawn skidders to clear the area around Lake Gordon and then sent the logs to a sawmill that was erected on-site.

Evidence indicates that between 1913 and 1987, forestry and timber harvesting activity on the properties consisted of periodic individual tree removal or removal of a group of trees. Unfortunately, a few areas were harvested through use of diameter limit cutting, a method that is not considered to be an acceptable or sustainable forestry practice.

Beginning in 1987, ECWCo approved a budget for forest inventory work and subsequent management recommendations to be completed on the properties. In the 1980's, the City used the services of a consultant forester, Dr. Rex Harper, who was at the time a professor of forestry at Allegany College of Maryland, to mark areas of trees to be thinned and to oversee timber sales on the properties. As stands were identified and marked for harvest throughout the late 1980's and 90's, forest management plans were created piecemeal for those stands. Until 2015, when an inventory was completed for this plan, Dr. Harper's work was the last time that a detailed forest inventory was completed for the properties. An overall plan was created by Dr. Harper and approved by the Pennsylvania Bureau of Forestry and the Cumberland Mayor and Council in 2000.

² Pennsylvania forest history information was sourced from PA DCNR's "Penn's Woods: A History of Pennsylvania Forests," which can be found here:

http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_009325.pdf

A land-use history study of the properties was conducted by Harrisburg Area Community College student Joshua Skinner in the fall of 2015. The study compared historical aerial photographs to quantify the land-use changes on the properties over a period of 74 years. The results showed a steady reversion of fields to forests, resulting in forest currently covering about 82% of the properties. See the appendix for this report.

Current Forest Condition and Management

ECWCo is aware that forest management and harvesting can increase forest health and, subsequently, water quality. As such, the company is committed to sustainably managing its forests. Although forest management and timber harvesting have occurred regularly on ECWCo's forestland in the past, those activities have been relatively absent on the properties in the last 8 to 10 years. In order to gain a current snapshot of forest health and value before planning future management activities, a forest inventory of the properties was completed, with the help of the Maryland Forest Service, in 2015.

Inventory Methods

Inventory plots were taken over a 5-month period. Distances between plots were approximately 500 feet. Data was collected utilizing Fountains TwoDog Forestry Software on a Trimble Nomad. Data from these plots was imported into the Fountains TwoDog office computer program to assist with the processes of statistics and analysis. The outcome from these processes was used to create a Forest Health and Condition Report, also known as Key Ecological Attribute (KEA) Report Cards (see Figure 2), which creates a visual picture on the current forest condition for the properties as a whole. As the past is always prologue, present conditions are results of past uses and abuses of the forest communities as well as soils, aspect, and other ecological factors.

Note, some of the stands did not have data available either because they were 1) less than 5 acres in size but contributed to the overall structure of the compartment, or 2) of a shape or size that did not accommodate a plot being placed in the stand.

Inventory Results

The inventory data analysis showed that the properties is primarily a red oak-mixed hardwood forest cover type with a west to north west aspect. The forest is composed of mostly even-aged, pole-size trees that developed from past harvests (clearcuts) or plantings. The species mix on the properties includes tulip tree (*Liriodendron tulipifera*), chestnut oak (*Quercus montana*), and red maple (*Acer rubrum*), as well as several other species. While there is some forest cover in conifers (Norway spruce (*Picea abies*), red spruce (*Picea rubens*), Virginia Pine (*Pinus virginiana*), eastern white pine (*Pinus strobus*), and hemlock (*Tsuga canadensis*)), conifers make up only a fraction of the overall forest cover. While the stands of conifers are of limited internal diversity, their presence helps with the overall diversity of the compartment. Conifer cover is also an important component of the landscape since it provides winter cover for many animal species that deciduous trees and shrubs do not provide.

As noted on the KEA report card, most of the stands are from fully stocked to overstocked. Those stands that are understocked may require management in order to improve the percent stocking level. Acceptable growing stock (AGS) is generally adequate on the forest. Where it is poor to fair, stands may be growing on soils that have considerable amounts of shale and very little topsoil or on soils that is very palustrine to hydric in composition.

Species diversity is on average good, with the lower scoring stands being those that are predominantly spruce or pine. The lower scoring stands also scored poorly on evenness, indicating that the diversity of species is low in those stands. Although some forest types are naturally low in species diversity, in general, stands that are less diverse are much more likely to be decimated in times of insect infestation or disease outbreak, such as in the cases of gypsy moths or chestnut blight.

Snags and standing dead woody material increase forest structure and provide shelter for many animals, thus adding to the health of the forest ecosystem. The majority of the ECWCo forest stands rate low for snags greater than 10 inches.

Figure 2. Key Ecological Attribute Report.

Forest Health & Condition Report								
Evitts Creek Tract								
3,800 acres; Bedford County, PA								
Allegheny Front - Key Ecological Attribute set and indicator ratings								
Steve Resh, Allegheny College								
Inventory Data Collected by Megan McKewen and Seth Clapper								
**Condition values were derived from 519 sample points established within the forested portions of the property								
Mgmt. Unit*	COMPOSITION				STRUCTURE		REGENERATION	
	Stocking (%)		Tree Species		Conifer Cover (% BA)	snags>= 10" dbh	all stems (regen)	% desirable (regen)
	TOTAL	AGS	Diversity	Evenness				
101	90	61	7	0.57	2	7	7857	60
103	100	98	8	0.74	21	0	3000	100
104	88	85	8	0.72	3	0	2887	100
107	130	115	4	0.88	0	0	4000	100
109	91	67	7	0.71	28	3	14000	77
110	81	61	4	0.30	0	0	19750	33
111	50	43	3	0.52	91	0	24000	96
112	101	79	19	0.83	3	5	27158	86
Compart. 1 Avg								
201	102	83	10	0.79	1	2	5714	95
202	97	85	12	0.78	2	4	12250	87
203	83	69	13	0.85	0	4	3400	82
204	103	87	18	0.88	6	2	12409	85
205	39	30	5	0.75	0	0	8333	100
206	99	92	10	0.85	0	30	3000	83
207	88	72	17	0.83	0	2	8000	97
208	105	98	6	0.79	0	10	34000	97
209	45	20	2	0.93	0	0	1000	100
210	41	30	5	0.88	0	0	4000	100
211	87	41	5	0.91	0	17	1000	100
213	98	82	17	0.79	0	7	10211	96
214	78	72	4	0.73	0	0	5000	100
216	106	88	17	0.66	0	4	6722	98
217	99	66	12	0.88	9	15	5333	86
218	120	95	18	0.87	10	3	23667	89
219	72	66	1	0.00	100	0	3000	100
220	89	65	5	0.49	83	2	3857	85
Compart. 2 Avg								
301	120	90	3	0.67	0	34	8000	100
302	120	82	13	0.88	17	1	8333	92
304	100	68	9	0.75	0	5	3250	100
306	120	65	8	0.91	0	5	7250	86
307	93	30	9	0.75	13	3	19000	78
310	0	0	0	0.00	0	0	26000	100
312	55	30	5	0.84	0	5	2857	100
314	88	78	20	0.80	0	0	5500	96
315	113	72	19	0.62	4	6	5625	89
317	112	72	16	0.84	3	5	14636	89
318	68	49	7	0.82	9	4	4667	100
320	85	77	5	0.69	0	5	9123	100
Compart. 3 Avg								
401	120	98	14	0.87	18	1	24250	96
402	118	97	17	0.83	2	7	19313	97
403	117	89	17	0.79	3	3	22912	88
404	86	79	13	0.83	1	3	22143	83
405	130	104	9	0.62	63	13	37600	87
406	55	45	3	0.55	33	22	10000	8
407	125	102	19	0.87	3	6	32036	96
410	114	94	15	0.82	0	5	25130	93
411	109	93	16	0.85	0	3	19684	98
412	118	87	21	0.79	2	5	23767	97
413	92	82	18	0.85	0	2	21667	80
414	88	76	19	0.86	15	2	34044	82
415	108	90	22	0.86	11	0	16952	88
416	111	83	5	0.79	42	0	4000	100
Compart. 4 Avg								
14								
RATING	Stocking (%)		Tree Species		Conifer Cover (% BA)	snags>= 10" dbh	all stems (regen)	% desirable (regen)
	TOTAL	AGS	Diversity	Evenness				
POOR	< 44	< 40	<=3	0 to 0.6	0 to 3	0 to 2	0-10k	<25
FAIR	45 to 58	41 to 53	4-8	0.61 to 0.7	4 to 8	3 to 5	10,001-15k	26 to 54
GOOD	59 to 79	54 to 69	9-12	0.71 to 0.8	9 to 16	6 to 8	15,001-50k	55 to 74
VERY GOOD	80+	70+	>12	0.81+	17+	9+	>50k	>75

Deer Browse Impact Rating	
RATING	
5	V. High Impact
4	High Impact
3	Moderate Impact
2	Low Impact
1	No Impact

Compartment Delineation

Compartment delineation creates smaller and more manageable land areas from a larger properties. This allows management of the properties to be simplified and specific to given geographic areas of the properties. Having different compartments also provides a good reference point for various user groups that may be unfamiliar with the ECWCo properties. Compartments were further separated into stands, which are manageable units exhibiting similar forest composition factors (see Forest Management section for stand description information).

The ECWCo properties consists of four compartments. Compartments were separated based on geographic positioning and natural separations by the properties boundary (see appendix, maps). Compartment 1 is a separate tract from the main properties and is the smallest in size at just over 418 acres. Compartment 2 is the second largest in size at 1,014 acres and is located on the northwest side of Lake Koon, the northernmost of the two lakes. Compartment 3 is located in the southern portion of the properties and is approximately 661 acres in size. Compartment 4, the largest compartment at just over 1,530 acres, is located on the eastern side of the properties and borders Lakes Koon and Gordon.

Stand Delineation

Inventory data was used to delineate the properties into stands, which are manageable units exhibiting similar forest composition based on factors such as species composition, age class, and overall health and condition. All of these characteristics are affected by a host of natural influences, including but not limited to slope, aspect, and the presence of non-native species. Such influential factors were considered during the process of stand delineation for this management plan.

In addition to inventory data analysis, other techniques were utilized in stand delineation. Aerial photography was used to distinguish hardwood stands from evergreen stands. Also, the aspect, topography, and physical features were consulted. Lastly, information was used from a previous properties-wide management plan to compare and contrast current stand types across the properties.

Stands have been characterized by the dominant forest community type and age class. This information is included in the stand summary table (see the appendix) and is displayed on maps found in the appendix.

ECWCo properties were separated into 72 forested stands. Stands were numbered according to compartment number. For example, Compartment 1 has stands numbered 101 through 112 and Compartment 2 has stands numbered 201 through 223. This is summarized in the stand summary table included with this plan (see appendix and maps for more stand information).

Desired Future Forest Condition and Management

The 2000 Forest Stewardship plan for the properties recommended broad-scale uneven-aged forest management, with the goal of maintaining water quality. While that recommendation may make sense from the conceptual standpoint of maintaining forest cover to protect water quality, the reality of the forest types present on the properties could mean that these recommendations actually put the health of the forest and forest cover at risk, thereby putting the water quality at risk. These risks are broadly related to the lack of advanced regeneration (tree seedlings and saplings) on the properties which was evident in the KEA report card.

Across the properties, the primary goal of forest management will be to protect the health and function of the forest communities, thus insuring protection of water quality, while following the forest management goals and guiding principles listed in the beginning of this plan. Encouraging a diverse species mix that is well-adapted to the site, along with a healthy understory, will create an opportunity for the growth of a forest that is resilient to disturbance. The forest will ideally also provide sustainable income while maintaining a mix of forest life stages: seedling/sapling, immature, and mature. Regeneration of the forest will ideally occur without the need for barriers against herbivores such as white-tailed deer. Regeneration should include natural re-growth as well as opportunities to re-introduce species that had been extirpated or removed from the properties, including American chestnut and pitch pine. Rotation ages will be 40 to 120 years for conifers and 100 to 120 years for hardwoods.

The species that will be primarily favored for management will include the red oak group, the white oak group, yellow poplar, sugar maple, red maple, eastern white pine, and pitch pine. The high conservation value habitat areas (HCV Areas), outlined below, will be managed so as to protect and enhance conditions for the species of concern. Lessons learned through research, management, and monitoring, will be applied to continually improve the effectiveness of forest management activities. Sites with concentrations of invasive plant species will be considered for additional treatment to contain and/or control the problem. Some areas that are open will be maintained as openings for habitat needs, while other openings will be allowed to revert back to forests. Furthermore, openings will also be created during forest management activities, such as harvests. These created openings may be used as a replacement for the openings allowed to revert to forests.

Natural Resources

Soils

Soils: Description

The United States Department of Agriculture (USDA) soil survey indicates that numerous soil types exist throughout the properties; they have been grouped by soil series for easier characterization. The 2 tracts are comprised of approximately 61 different soil types, grouped into 35 soil series (see Soils Map and Appendix C). The USDA soil survey for Bedford County

also indicates that the soils throughout the ECWCo properties are appropriate for timber management.

On the main tract, four soil associations occupy about 50% of the land base. These predominant four soils are Buchanan, Elliber, Hazelton-Clymer, and Laidig. The most dominant of these soils is Buchanan (Bu, 21%) and is described as a cobbly loam which can be found on 0 to 45 percent slopes. This soil type is very deep, poorly to moderately well drained, and slowly permeable, and the major use is woodland (mixed hardwoods of oak, maple, and ash). The productivity of the soil type is very good with tulip tree/yellow poplar having a site index of 90. The second most prevalent soil that encompasses an additional 13% of the tract is the Elliber (El) complex, which is described as very channery loam and can be found on mountain slopes of 3 to 25 percent. These soils are very deep and well-drained, and are found on side slopes and the tops of secondary ridges in the Appalachian Ridge and Valley. About one-third of Elliber soils are cleared, mostly for orchards, and the remainder is mostly in woodland (mixed hardwoods). The productivity of the soil is very good, having a site index of 90 for yellow poplar. The third most prevalent soil is Hazelton-Clymer Association (HTC) at 11% of the tract. This association is described as very stony sandy loam, and is deep and well drained. Most of this association is in woodland, and the main limitations to woodland production are surface stoniness and areas of steep and very steep soils. The productivity for this soil is average for yellow poplar, having a site index of 80. Finally, the fourth major soil type on this tract is Laidig (Ld, 5%). This soil series is described as a cobbly loam on slopes ranging from 0 to 55 percent. These soils are very deep and well-drained, and most areas are forested with red, white, and chestnut oaks being the most common trees and the occasional sugar maple, beech, and hemlock. The productivity for this soil association is very good, having a site index of 90 for yellow poplar.

The northern tract has three dominant soil types occupying nearly 70% of the land base. These soil types (Buchanan, Elliber, and Morrison) are very similar to those of the main tract. Buchanan soils comprise 37.2% of the tract, while Elliber soils account for 26.3%. The descriptions of these soils can be found above. The Morrison series (Mr), which makes up 6.1% of the tract, is described as a channery sandy loam found on slopes between 0 and 50 percent. These soils are very deep and well drained, are found in upland valleys, and are about 75% forested. Wooded areas contain mixed oak and some pine. The productivity of this association is average, with a site index of 85 for yellow poplar.

Soils: Management

Soil and its ecosystem is an integral part of the larger forest ecosystem. The productivity of the forest depends on soil health. Thus, ECWCo and its partners will pro-actively manage the soil resource and its important role in the forest ecosystem.

Before any timber harvesting occurs, soils within the treatment area will be visually assessed to check the compatibility of the soils for operations. Attributes that will be checked include the suitability for development and erosion potential of proposed landing and skid/haul roads sites. Harvest equipment operability will also be checked for tire- and track-based machinery. The ratings given in each survey will be based on an interpretation of slope, rock fragments on or below the surface, plasticity index, content of sand, depth to a water table and ponding in the soils present. Some soils may be considered “seasonal soils,” which means only during certain

times of the year when conditions are appropriate, perhaps during winter months when soils are frozen or during summer months when soils are very dry, will they allow for harvesting with minimal disturbance and damage. Best Management Practices (BMPs) will also be used to minimize environmental impact.

Property Access Roads

The interior access roads of the properties are maintained by ECWCo. Some of the roads have seen improvements such as crowning, installation of water bars, and other best management practices. There has been a push to do such work as brush cutting, day lighting, gravel amendments, and tree removal on those roads that are more frequently used for access. There has also been a demand for maintaining the gates (painting, numbering, and mowing) so that they can be readily seen and to discourage vandalism or other adverse behaviors. Maintenance on the private roads is not consistent, with some of the adjoining owners doing work to keep the roads crowned and free from brush, while other owners do nothing and rely on the ECWCo to carry out the road maintenance.

Unauthorized ATVs, off road cars/trucks, UTEs, "dirt" bikes and mountain bikes are prohibited on roads within the properties; only foot traffic is allowed. Nevertheless, unauthorized all-terrain vehicles (ATVs) have impacted some of the roads on the properties-they generally enter the properties from adjacent lands. The ECWCo works with cooperating law enforcement agencies to police the problem and find solutions to access issues.

Access is critical for most management activities including, fire protection and suppression, wildlife habitat improvement, and recreation. However, poorly designed roads can drastically increase soil erosion, and, subsequently, water pollution. Therefore, the following management guidelines will be used for roads:

- State publications on erosion and control procedures will be followed as appropriate for layout, design, construction, stabilization, and maintenance of a road system.
- Prior to and following management activities, roads will be evaluated for inadequacies or additional needs and addressed at that time.
- Roads will be categorized as those worthy of investment for all-weather access, seasonal use roads, and possible future recreational trails.
- Any road segments that need attention will be identified and prioritized for future annual work plans.
- Access roads that have little or no annual traffic or duplicate the route of another road will be considered for closure.
- State, county, and township rules and regulations on private roads will be followed during management activities.

Water Resources/Riparian Zones

Water Resources/Riparian Zones: Description

Forestlands provide a steady source of clean water to streams and tributaries, and act as nutrient sinks across the landscape, absorbing more nutrients than they release. Water, like timber, is a renewable resource when properly managed. With careful planning and management, forests will provide clean water while at the same time providing many other resources.

The ECWCo properties lies within the Potomac River Basin. This river system drains into the Chesapeake Bay, a vitally important ecological and economical resource in the mid-Atlantic region. The ECWCo properties includes 2 reservoirs, Lake Gordon and Lake Koon. These 2 man-made lakes are fed by 2 named perennial streams, Growden Run and Evitts Creek. Evitts Creek flows into the northeast portion of Lake Koon and is the larger of the streams.



Figure 3 Large Vernal Pool found

The watershed for Evitts Creek is located to the north through Cumberland Valley, with several headwater streams forming on the Buchanan State Forest and Pennsylvania State Gamelands. Growden Run flows into the northwest portion of Lake Koon. This stream is much smaller and drains only a small area to the north and west, with most of its headwaters forming on the east side of Wills Mountain.

The properties also consists of several intermittent and ephemeral streams. The majority of these occur in Compartments 1 and 4, on the west side of Evitts Mountain. They also occur in Compartments 2 and 3, on the east side of Shriver Ridge. It is likely that some of these streams are fed by spring seeps along the base of Evitts Mountain. The vast majority of the streams located on this properties are considered to be adequately buffered with forest. These streams have been identified and labeled on a map.

One vernal pool was discovered and its location recorded during data collection on the ECWCo properties in 2015 (see Figure 3). There are likely more vernal pools on the properties; Pennsylvania Natural Heritage Program plans to do additional survey work. Vernal pools are unique and vulnerable kinds of wetlands. They are usually ephemeral (temporary) pools that fill with snowmelt and spring run-off, and then dry out sometime during the summer. However, vernal pools also include pools that fill at other times of the year. Many of these pools are vital breeding habitat for amphibians and invertebrates. For additional information on vernal pools and their significance to a variety of wildlife species please refer to the appendix.



Water Resources/Riparian Areas: Management

ECWCo will proactively manage the water resource and aquatic ecosystems to maintain the quality of both for the public good. Buffers along perennial and ephemeral streams, lakes, and all wetland features will be established and managed in accordance with best management practices to minimize erosion and avoid damage to wetland features. All buffers on the ECWCo properties are designated in the Streamside Management Zone (SMZ) as delineated below. Approximately 371 acres fall into the designated SMZ areas. Management guidelines for the SMZ are clearly outlined in Principle 6.5 in the FSC US National Standard. Pennsylvania Best Management Practices (BMPs) will be followed, and all FSC US National SMZ management guidelines will be met or exceeded to minimize operational impacts and protect water quality during all activities.

SMZ Delineation: SMZ will be delineated on the ECWCo properties when management activities take place using the Inner and Outer Zone structure. A 50 foot Inner Zone and additional 100 foot Outer Zone (total 150 foot buffer) will be recognized along all surface water, including perennial and intermittent streams as mapped. **These distances will be doubled (300' total buffer with a 100-foot Inner Zone and 200 foot Outer Zone) around both water supply reservoirs and along the main stem of Evitts Creek to protect water intakes and the riparian ecosystem.**

Management in Inner and Outer Zones: No harvesting will be pursued within the Inner Zone, and harvesting in the Outer Zone will be limited to thinning to retain 60% or greater canopy cover. There will be no regeneration harvests within the Outer Zone. No roads or main skid trails will be located within the total buffer zone except where they approach stream crossings. Stream crossings will be designed and maintained according to Pennsylvania BMP's to protect water quality and preserve stream function.

Exceptional Value and High Quality Designations: The entire Evitts Creek basin within PA is designated High Quality for Cold Water Fishery and Migratory Fishes. ECWCo commits to maintaining Pennsylvania Department of Environmental Protection recommended 150-foot buffer (a 50 foot Inner Zone and 100 foot Outer Zone) on all Exceptional Value (EV) and High Quality (HQ) perennial and intermittent streams. While limited timber harvest activities will occur in the Outer Zone, a 50-foot No-Harvest Inner Zone (except for the removal of wind-thrown trees) will be maintained. ECWCo also commits to maintaining 60% canopy cover and No-Harvest on slopes > 40% in the Outer Zone. Both criteria exceed FSC recommendations for the Appalachian Region.

Herbicide Use: No broadcast herbicide treatments will be applied within Outer or Inner SMZ except in significant occurrences of riparian-related invasive species. Only herbicides labeled for riparian and wetland use may be used within the SMZ.

Other Significant Wetland Features: Additionally, other significant wetland features such as springs, seeps, and vernal pools will be mapped and evaluated for their protection needs as it relates to site specific variables, including water quality protection and wildlife features. They will be buffered as follows:

- Springs and seeps: 100' no entry buffer (except where existing roads cross into this buffer).
- Vernal pools: 100' no entry buffer for heavy equipment around significant vernal pools, maintaining minimum of 75% canopy cover and promoting establishment/protection of large down and dead woody material, This management zone will be extended outward another 100' where features exist which are conducive to amphibian breeding to protect and enhance this habitat; there will be no broadcast herbicide application within the total buffer.
- Existing skid trails within wetland buffers will be decommissioned as appropriate.
- No disturbance or timber harvest activities will occur within wetlands. Wetland buffers will be developed on a case-by-case basis to ensure exemplary water quality and Exceptional Value wetlands are maintained. Characteristics to evaluate when determining appropriate buffer widths include the steepness and erodibility of surrounding hill slopes, soil permeability and infiltration rates and capacities, as well as the density and type of buffer vegetative cover. Mechanical or silvicultural operations within buffers are permitted solely for the restoration, maintenance, and creation of wetland or riparian values or water quality protection. This could include invasive species control, permitted stream crossing construction, or sanitation harvesting to protect stream banks from destabilizing windthrow or culvert pipes from blockage.

Wildlife

Wildlife: Description

Given the mobile nature of wildlife, it is difficult to provide a snapshot of which wildlife species are present on a specific properties at any given time. However, it is assumed that the ECWCo properties are utilized at one time or another by the majority of wildlife species that exist in Pennsylvania. Wildlife species in Pennsylvania include 414 species of wild birds, 285 of which are regular inhabitants of the state, and 66 species of wild mammals, including black bears. More information about wildlife species can be found on the PA Game Commission website.

Wildlife: Management

The rich diversity of wildlife species located within the ECWCo requires the use of a wide array of adaptive management techniques. The objective is to utilize adaptive management to address the ecological needs of this diversity of wildlife species and habitat types, including different successional stages of forest, (e.g., distribution, size, composition, and juxtaposition of forest patches), riparian buffers, corridors, and interior forest habitat. This approach requires management prescriptions that are anchored in the ecological principle that all of the habitats function in relationship to each other. This is not a definitive prescription, rather an adaptive attempt to best serve the species located on these lands.

ECWCo's goal is to manage the properties in a predominantly forested state, while fostering a diversity of forest communities and age classes to benefit native wildlife species. Structural complexity in the forest with a healthy understory of shrubs, saplings and seedlings will be the

desired state for both forest health and wildlife habitat. Early successional forests and patches of conifer dominated forests will add to the matrix of habitats and favor certain species that utilize these features. The naturally occurring wetlands provide cover and additional diversity of wildlife habitat. It should be noted that any set of habitat features favors some species and discourages others. The ECWCo properties will be managed for diverse habitats and not particular species, with the exception of certain species of concern per the PA Natural Heritage Program. Partnerships will be encouraged between ECWCo and the Pennsylvania Game Commission, Natural Resources Conservation Service, the US Fish and Wildlife Service, and others as appropriate to provide the resources needed to pursue wildlife management goals on the ECWCo lands.

Several specific wildlife management goals integrate well with the overall management plan on the properties. Various oak species are the dominant trees on much of the properties and the acorn crop is a critical food source for small mammals, deer, bear, turkey, and grouse, along with a number of other species. Since year-to-year variation in acorn crops can be significant and different oak species can have good crops in different years, it is important to allow the oaks to mature and to maintain a mix of oak species to maximize the production of acorns for wildlife. In the future, American chestnut should be reintroduced in the form of resistant seedlings to add another significant hard mast species for wildlife, thereby increasing species diversity.

Oak will be the focus of wildlife management in the forest, and even-age management will be pursued to successfully regenerate oak. Selection of leave trees in timber harvests will retain cavity trees, snags, and certain soft mast producing species such as serviceberry, wild grape, and black gum. This approach is also compatible with golden-winged warbler BMPs and will provide favored habitat for woodcock, cottontails, hares, and various ground nesting and early successional song birds.

Deer are one of the few wildlife species that not only respond to habitat changes but also create them. Quality Deer Management (QDM) is an approach which recognizes the dynamic of the deer and their habitat and seeks to maintain a herd with a more natural sex and age structure that are in better balance with food supplies in the habitat. The QDM approach strives to hold the herd at a level where the vegetation will be under less stress from over-browsing. Recent statewide and local efforts to maintain healthy deer populations below carrying capacity and restore the habitat quality have shown encouraging results. Deer hunting programs should be targeted where necessary to allow full recovery of the understory habitat that has been diminished from overpopulation and over-browsing.

Other wildlife management guidelines will be incorporated into management treatments to address 1) down and dead woody material, 2) cavity trees, 3) vernal pool protection and 4) riparian zone management.

More information on wildlife management priorities and approaches statewide is available in the [State Wildlife Action Plan](#)³.

³ <http://www.portal.state.pa.us/portal/server.pt?open=514&objID=622722&mode=2>

Rare Species and Communities

Rare Species and Communities: Description

The Pennsylvania Natural Heritage Program maintains the Pennsylvania Natural Diversity Inventory (PNDI), which is a database of the Commonwealth's rarest and most significant ecological features. These include plant and animal species of special concern, rare and exemplary natural communities, and outstanding geologic features. Table 1 lists the plant and animal species known from the PNDI to occur on or near the ECWCo properties.

Common Name	Scientific Name	On/Off Properties	State Rank / Listing
Schweinitz's sedge	Carex schweinitzii	on	S1 / Threatened
sterile sedge	Carex sterilis	on	S1 / Threatened
common shooting-star	Dodecatheon meadia	on	S1 / Endangered
box huckleberry	Gaylussacia brachycera	off	S1 / Threatened*
Canadian milkvetch	Astragalus canadensis	on	S2 / Imperiled
tooth-cup	Rotala ramosior	on	S3 / Vulnerable

* Proposed for state endangered listing

Table 1 State Listed Species on the ECWCo properties.

In addition, a bald eagle nest is located within close proximity of the properties. Disturbing the nest is considered a "take" under the Bald and Golden Eagle Protection Act, and a permit may be required. This nest will be considered when planning any forest management activities nearby. More information about bald eagle management actions can be found in the National Bald Eagle Management Guidelines (a copy is in the appendix) or by visiting the US Fish and Wildlife Service website (www.fws.gov).

A globally rare plant community is found on the ECWCo properties: Side-oats gramma calcareous grassland. These grasslands occur as small, prairie-like openings in areas of thin soils over calcareous bedrock. The dominant vegetation is grass, although scattered forbs and woody species are usually also present. Side-oats gramma (*Bouteloua curtipendula*) is present throughout the grassland, making this potentially the largest occurrence of this species in Pennsylvania.

Rare Species and Communities: Management

Prior to any timber sale, prescribed fire, invasive species control, habitat restoration or road building activity, any rare species or communities (G1-G3, S1-S3) within the management unit or project area will be located and mapped. Talus, scree slopes, rocky outcrops, or any boulder fields will also be located and mapped.

- In advance of a proposed management activity, such as a timber sale or a prescribed fire operation, staff will query PNDI to see if

rare species or communities are likely to occur in those stands.

- If necessary upon unique circumstances, such as the finding undocumented RTE's in the field, the Pennsylvania Natural Heritage will be notified.
- Best Management Practices (BMPs) designed to protect eagle nesting areas will be followed during planning and implantation of any management activity.
- Per Pennsylvania Fish and Boat commission requirements, a 300-foot buffer will be maintained between the proposed activity and talus, scree slopes, rocky outcrops, or any boulder fields.

Non-Timber Forest Products (NTFPs)

NTFP: Description

Non-timber forest products can represent a diverse array of living or dead plant materials, lichens, fungi, or other forest organisms that are used in a variety of ways to benefit people. The common categories of NTFPs include medicinal and herbal products, decorative and specialty wood products, along with edible products. While NTFPs have perceived economic and/or consumptive value for humans, they can also represent forms of biodiversity that are critical to maintain on the landscape from an ecosystem management perspective.

Collection of NTFPs is regulated by the Wild Resource Conservation Act of 1982. Collection of rare, threatened, and endangered plant species is specifically controlled by DCNR through the provisions of the Wild Resource Conservation Act, P.L. 597, No. 170.

An example of an NTFP found on the properties is American ginseng (*Panax quinquefolius*). The native plant American ginseng was historically abundant in Pennsylvania forest lands. Because of its value and importance as a national commodity, the export of ginseng is regulated by the U.S. Fish & Wildlife Service. Ginseng has been listed as a vulnerable species in Pennsylvania due to the demand and suspected overharvesting. Since 1985, the PA Bureau of Forestry has been the regulatory agency for the trade and export of ginseng harvested in Pennsylvania and issues vulnerable-plant licenses to authorized ginseng dealers.

Within limits and with proper management, future generations of users will be able to continue the long-established and cherished tradition of gathering NTFPs from forest land. However, many natural resource professionals are becoming increasingly concerned with the sustainability of these resources. Unfortunately, little is known about the removal rates of NTFPs from forest lands for personal use, and even less is known about the population status of plant species used as NTFPs. Further, much remains to be learned about the maintenance needs, life history characteristics, and natural distribution and abundance of many NTFP species before sustainable management guidelines can even be developed.

NTFP: Management

There is no commercial harvest of NTFPs on ECWCo lands. There is some recreational harvest of blueberries, blackberries, and mushrooms. At this time, there is no indication to suggest concern regarding the current number of people searching for and harvesting NTFPs on the ECWCo's properties. Currently, ECWCo does not restrict the harvest of NTFPs, however it does not actively promote or endorse such activities. Monitoring of the harvest of NTFPs is done

primarily through information provided to forest managers by the public, and observations of forest managers cooperating agency law enforcement personnel and associated staff who spend time working in the field. If a significant increase in the harvest of NTFPs were to be identified, the ECWCo staff with the approval of the ECWCo board would develop an action plan with public stakeholder involvement at an Evitts Creek Steering Committee meeting.

Historical and Cultural Resources of the Region

Historical and Cultural Resources of the Region: Description

The ECWCo will protect cultural resources as well as natural resources through management of its forest land. Much of Pennsylvania's cultural history is tied to its historically forested landscape and geographic and geologic features. Hunting, fishing, berry and mushroom picking, and rattlesnake collecting are traditional pastimes for many citizens. Timber, mining, metallurgy, and agriculture having been lead industries at various times in the state's past, at least since European settlement. Prior to this time of settlement, the region was the setting for Native American culture and activity for millennia.

Within Pennsylvania, there are 15 federally recognized Tribes who ascribe cultural significance to part of or all of the land within the Commonwealth. The Pennsylvania Department of Transportation (Penn DOT) Bureau of Design's Cultural Resources Management Program works closely with other Federal and state agencies, local interest groups, preservation advocates, Native Americans, and the general public to ensure that its projects are designed to meet the transportation needs of the state and promote stewardship of our cultural heritage. Therefore, PennDOT has established a systematic approach that will be replicated in a similar manner by ECWCo to facilitate consultation with select Tribes when a project/management activity occurs on historic properties of religious or cultural significance. The contact information for the associated tribes relevant to the ECWCo properties is in the appendix.

Known cultural resources include remnant foundations of old farmsteads and five cemeteries located on the properties. When Lake Koon was constructed, a covered bridge over Evitts Creek was removed, a church (near where the present Lake Koon boat access is located) was torn down, and the church cemetery was relocated to an area along Growden Road.

Historical and Cultural Resources of the Region: Management

Historic and cultural resources are a vital link to past land-use practices in Pennsylvania. The Pennsylvania Historical and Museum Commission (PHMC) has been collecting information concerning archaeological sites and historic resources for the greater part of a century. They offer programs which survey, catalog, and encourage the preservation of such resources. Currently there are 23,460 archaeological sites and 132,171 historic properties in their files. Access to these paper records is free and open to the public by appointment at the BHP office in Harrisburg.

On January 15th, 2016 The Nature Conservancy (as a project partner in the ECWCo management planning project) performed an extensive search on The PA Historical and Museum Commission

Bureau for Historic Preservation (PHMC)'s Cultural Resource Geographic System (CRGIS) (www.dot7.state.pa.us/CRGIS/main.htm).

The CRGIS is a three-tiered GIS program consisting of state-wide historic and geologic site data combined with PA Natural Diversity Inventory (PNDI) information. The result of that assessment showed that there are no known sites of significance within the properties regarding indigenous peoples or any other historic or cultural resource. It is noted that there are multiple buildings within and adjoining the Evitts Creek properties that are identified on the database as having been built circa 1830-1932, but there is no documented information to suggest historic significance or importance for preservation.

Recreational Opportunities

Recreational Opportunities: Description

The ECWCo lands have long been used for outdoor activities by people throughout the tri-state area. Through the efforts of the Evitts Creek Steering Committee, opportunities have been improved for property, especially for those with disabilities. The addition of a handicap access pier at the Lake Koon boat ramp, has provided many fisherman the opportunity to get better access, especially getting into boats for fishing.

While activities such as swimming, camping, and ATV riding are prohibited on the property, other forms of recreation such as hiking, mushroom hunting, and birding, are accepted and encouraged, especially for children and the disabled. Road biking has seen an increase in usage around the lakes, and staff has been asked about increasing opportunities for mountain biking and horseback riding. At this time, it is discouraged because of the potential impact upon water quality, but staff is working on what can be done to minimize the impacts those activities would have.

Staff has also been involved with Buchanan State Forest and Rocky Gap State Park in looking at what opportunities there are in the greater community to encourage a trail system to link the three properties that will not adversely impact the ecological resources that exist.

Recreational Opportunities: Management

Recreation plays a vital role in a healthy lifestyle. Recreational activities can cause problems such as compaction, loss of habitat, and unfortunately, litter and pollution. Policies regarding activities, besides hunting and fishing, should be developed by staff with over site provided by the Evitts Creek Steering Committee and the Mayor and City Council of Cumberland.

High Conservation Value Areas

High Conservation Value Areas: Description and Approach

High Conservation Value (HCV) Area Identification

The method used to define and meet the HCV requirement follows the four-phased approach of *assessment, consultation, inventory, and monitoring* as outlined in the Standard and

applied as follows. Contiguous forest blocks in the High Allegheny Plateau and Central Appalachians have been identified as a priority for the managers of the Evitts Creek Water Company and The Nature Conservancy.

In conjunction with Evitts Creek Water Company staff, Maryland State Forest Service ecologists, Conservancy ecologists and outside experts, project participants have embarked on a process to identify and map HCV areas. A few types of HCV have been identified on Evitts Creek properties through a combination of biological database reviews, internal team expertise, and review of ecological priorities of state agencies and other conservation groups operating in the region. Specifically, occurrences of rare species were identified through data provided by the Pennsylvania Natural Heritage Program. Consultations with Heritage staff and others are noted below. Additionally, a map demarcating HCVs is also embedded.

The HCV framework includes the following six categories:

HCV 1: Forest areas containing globally, regionally or nationally significant concentrations of biodiversity (e.g., endemism, endangered species, refugia)

1.1 There are no legally protected or managed areas on the property

1.2 There are four mapped areas on the Evitts Creek properties that contain significant concentrations of rare species, identified and ranked as globally or state rare by Heritage. These include a variety of herbaceous plants, insects, trees, and plant communities.

Total Number of HCV 2 Areas: 4

Total Area of HCV 1: 470 acres

HCV 2: Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance

2.1 No large, roadless areas are known to occur on the property. Much of the property is bisected by roads and much of it has been harvested.

Key resources: publicly available Natural Area Inventories

Total Number of HCV 2 Areas: 0

Total Acres of HCV 2: 0

HCV 3: Forest areas that are in or contain rare, threatened or endangered ecosystems

3.1 No old growth was detected within the property.

3.2 No roadless areas are known to occur on the property due to prior management activities.

3.3 There are no rare ecosystems located on the property.

Total Acres of HCV 3: 0

HCV 4: Forest areas that provide basic services of nature in critical situations (e.g., watershed protection, erosion control)

4.1 While the entire property provides a source of drinking water, the most critical areas to protect include public drinking water withdrawal points and the reservoirs, which have 150-foot (50-foot inner no harvest zone and an outer 100-foot zone with limited activity/disturbance) special management buffer zone. This is doubled around reservoirs and the main stem of Evitt's Creek (See Riparian Areas Description and Approach).

4.2 Approximately 90% of the property lies within a source-water or public drinking water watershed, but the truly High Conservation Value areas are those that buffer public water withdrawal points and reservoirs, as outlined above.

4.3 There are no floodplains or significant wetlands within the water-supply watershed. Vernal pools will be buffered appropriately, but are not considered HCV areas.

4.4 While erosion is always a concern, the HCV buffers mentioned above and riparian buffers address those concerns. There are no areas on LA lands that would be considered critical to prevent erosion, landslides, avalanches, etc.

Total Acres of HCV 4: 371 acres

HCV 5: Forest areas fundamental to meeting basic needs of local communities (e.g., subsistence, health)

5.1 Evitts Creek Water Company lands would not be considered fundamental to meeting basic needs of local communities, other than for water provision, which is covered above.

HCV 6: Forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities)

6.1, 6.2 Evitts Creek Water Company lands probably would not be considered as fundamental to traditional cultural identity in the area.

II. Consultation with appropriate experts for the purposes of this assessment:

For the purposes of this assessment and more generally, Evitts Creek staff and TNC staff regularly consult with biologists from the Pennsylvania Natural Heritage Program (Tony Davis),

Pennsylvania Game Commission (Clay Lutz), DCNR Bureau of Forestry (Ellen Shultzabarger), and other conservation organizations, such as Western Pennsylvania Conservancy. In particular, PA Natural Heritage helped provide information on HCV 1, 2, and 3 designations.

III. Approach to Managing HCV Areas

HCV 1.2 – HCV areas with concentrations of biodiversity, including species of conservation concern will typically not be managed, unless there is a threat to the health of these areas or, with further research, it is shown that the species present require special treatment (e.g., prescribed fire, invasives treatment, retention of openings).

HCV 4.1 – 4.2 – Source Water Buffers

Drinking water supply areas, including reservoirs and the main stem of Evitts Creek, are buffered with 300 foot buffers (100-foot inner zone and 200-foot outer zone). These areas are typically not managed, unless there is a threat to forest health. Water quality is routinely monitored for any change.

IV. Monitoring HCV Areas

HCV 1.2 – The state requires the county to have an updated plan on species of concern that occur in that county. This includes Natural Heritage periodically monitoring those species and communities, particularly in areas where there is some form of activity is planned. In those cases, proposals must be submitted to Harrisburg, mapped, and approved by the corresponding agency.

HCV 4.1-4.2 – Water samples are regularly taken at the water intakes by the Evitts Creek Water Company and sent off to the lab that does testing and provides the City with the results. Those results are given at Evitts Creek Steering Committee meetings and annually reported to the public along with their water bill. During the course of the year, Evitts Creek is required by the state to do ocular surveys of the property to make sure everything is in good shape. During those visits, regular ocular monitoring of buffer zones occurs and any larger-scale forest health issues that affect the integrity of buffer zones will be identified.

Forest Stressors

Forest Stressors: Description and Management

A multitude of forest stressors have resulted in moderately to severely degraded forest conditions in many areas of Pennsylvania. These forests are increasingly susceptible to invasive species

outbreaks and their deleterious influence on forest restoration and conservation goals. The proliferation and overabundance of native and non-native competing vegetation is challenging the ability of forest managers to cost-effectively produce desired economic and ecological forest conditions.

Competing vegetation, both non-native invasive species and unnaturally high densities of some native plant and tree species (e.g., Japanese barberry, black birch, and red maple) are inhibiting the establishment and advancement of desirable growing stock (regeneration). Land management efforts must focus on maintaining the health of the existing overstory and the seed producing capability of our forests and managing undesirable understories that inhibit the accumulation of desired stand attributes and will continue to do so in the future.

Without successful regeneration of forest trees, no silvicultural system is possible. Managers of the forest must consider a range of challenges to the regeneration of healthy forest stands during silvicultural treatments. The following lists both historic and currently emerging challenges to successful regeneration:

White-tailed Deer

Deer populations vary considerably across the area. At the present time deer densities in the area seem to be low enough to allow oak regeneration to become established. Populations are also affected by chronic wasting disease (CWS).

Competing Vegetation (Woody & Herbaceous)

Greenbriar: Not a wide spread problem but some local thickets are a problem. Woven wire deer enclosures protect greenbriar from deer and can make the problem worse.

Tree-of-Heaven: This exotic tree species is invading where the forest has been disturbed. Where Tree-of-Heaven is scattered it is easily controlled by basal spraying, hack and squirting or felling and treating the stumps. This is impractical where it is present in large numbers. There has been some dieback and death of the trees possibly due to verticillium wilt.

Japanese Barberry: This exotic species has a seed that is spread by small mammals and songbirds. It can create impenetrable thickets that continue to spread further into the forest and inhibit natural regeneration of other species. This shrub is mostly found near old home sites and along public roads.

Other competing invasive species present in limited areas include mile-a-minute, honeysuckle, oriental bittersweet, and autumn olive.

Native and Non-Native Pests

Of the pests that affect forest resources, hemlock woolly adelgid, forest tent caterpillar, and gypsy moth have caused the most damage in terms of tree defoliation and mortality in recent years. Additionally, the emerald ash borer is present in Bedford County. Unfortunately, some of the ash on the properties is already infested and will need to be salvaged or left to decomposition. Ash that is in areas that pose a risk (such as along road sides) will be removed to minimize the hazard.

Perhaps the longest-standing effort to manage forest pests in Pennsylvania has been gypsy moth control programs. The gypsy moth has been causing significant forest damage in Pennsylvania since the 1970s. The most recent outbreak occurred between 2005 and 2010, and this pest has been the principal agent of oak tree mortality. Gypsy moth outbreaks have been cyclic over time, with populations growing and declining over a given period. Landowners should deploy an integrated pest management approach to monitor gypsy moth or other insect pest populations, and if warranted, follow up with a course of action to lessen tree mortality and slow the spread of them.

Additional Forest Stressors

Additional potential forest stressors include frost, drought, flooding, and the impact of acidic deposition.

Wildfire

Wildfire is a common occurrence in Pennsylvania. In fact, the Pennsylvania Department of Conservation and Natural Resources (DCNR) responds to over 600 wildfires in an average year, which burn more than 4,000 acres of land. Local fire departments also respond to wildfire incidents.

Wildfires can occur during any month of the year, if the conditions are right. However, most wildfires in Pennsylvania burn in late fall and early spring, typically from mid-October to mid-December, and from mid-February to mid-May. While summertime is hot and can have droughts, the relative humidity of the air is high and the forests are covered in lush green leaves. This helps keep the forest floor cool and the moisture of the wildland fuels high. In fall and spring the relative humidity of the air is lower, and with it, the moisture content of the dead leaves and sticks. There are also no leaves on the trees, allowing sunlight and wind to reach the forest floor, making the fuels even more dry and flammable. These fast-drying fine dead leaves and twigs are the primary fuel that ignite and carry wildfires.

Most wildfires in Pennsylvania are surface fires, which burn fallen leaves, twigs, and debris on the ground. In typical hardwood forest litter, flame lengths can range from six inches to four feet or more. With the influence of a strong wind or steep slope, these surface fires can spread very quickly. Under the fallen debris on the forest floor is often a layer of partially decomposed leaves and humus, called “duff.” During dry periods, fires can burn underground in this duff layer, and be very difficult to extinguish. These duff fires can burn for weeks, or even months, and cause smoke issues.

The intensity of wildfires increases greatly in areas of dense fine fuels, such as grasses, or dense resinous fuels, such as mountain laurel shrubs or evergreen trees. In these areas, wildfires can spread rapidly and burn with amazing intensity. Pennsylvania rarely experiences active crown fires – wildfires that burn in the tree canopy – especially in the mountainous regions. However, in dense stands of evergreen trees during times of very dry and windy weather, individual evergreen trees can “torch” and crown fires can possibly occur.

Fuels, weather, and topography are the three factors that control wildfire behavior. As the amount of available fuel increases in a given area, the intensity of a wildfire in that area will increase. In all fuel types the intensity and rate-of-spread of a fire will increase as slope increases, wind increases, and relative humidity decreases.

The only natural cause of wildfires is lightning, and typically accounts for less than 2% of the wildfire ignitions in Pennsylvania each year. The remaining 98% of wildfires are caused by human activities. This means that where there are people, there is fire. Pennsylvania's leading causes of wildfires is improper debris or outdoor burning. Debris burning typically ignites around 40% of the wildfires each year. Arson, the second leading cause, accounts for around 30% of ignitions. Other causes include: equipment use, children playing with fire, campfires, railroads, and other miscellaneous ignitions from sources such as downed power lines, discarded woodstove or fireplace ashes, and fireworks. More information on wildfire statistics for Pennsylvania can be found at <http://www.dcnr.state.pa.us/forestry/wildlandfire/index.htm>.

There have been wildfires in the past on the properties, most associated with illegal camping activities or other unsanctioned gatherings.

Forest Management Practices

Management Zones

The ECWCo properties has been zoned with the following Land-Use Classifications (see map in appendix):

1. **General Management:** This land-use covers most of the properties. While the primary management objective is to maintain high water quality, the forest also needs to maintain a healthy state by having a diversity of forest types and vertical age structure using various silvicultural techniques. These techniques may include, but are not limited to non-commercial and commercial partial harvesting (thinning) and variable retention harvests.
2. **Streamside Management/Buffer:** This land-use is for those areas adjacent to streams, creeks, and the lakes. The outer part of this zoning will allow entry for silvicultural activities on a controlled basis; the inner portion will limit entry for silvicultural activities unless it is needed to maintain the overall health of the forest (such as an invasive insect or plant infestation).
3. **HCV/Special:** This land-use is for those places that have situations that require special attention to active operations so as to not cause additional complications or conflicts. An example would be the boating access at Lake Koon. For HCV areas, it means that activities need to maintain or enhance the values present, for example, if there are aggregations of rare species or community types that will benefit from active forest management practices.
4. **Reserve:** This land-use is for the places that would benefit from avoiding active management operations such as cliffs, graveyards, and some HCV. Activity will be

allowed if a situation arises that required entry to mitigate a problem that would affect public safety or forest health.

Silviculture

Overview

The successful maintenance of existing forest communities and timely regeneration of diverse forest communities will be promoted on ECWC's forest lands. The management of ECWCo's forest lands will promote silvicultural practices that sustain ecological and economic forest values.

Silvicultural Treatments

In addition to the forest management guiding principles mentioned in the beginning of this document, silvicultural treatments for forested stands on the ECWCo properties will be based on one or more of the following objectives:

- Maintaining forest health
- Extending the rotation age of native forests to 100 -120 years
- Diversifying forest age structure/encouraging stand regeneration

In order to successfully manage the forests of the ECWCo to meet the goals and guidelines mentioned above, a variety of silvicultural treatments may be used. These treatments may include, but not be limited to: various types of thinning (both commercial and non-commercial), variable retention harvests (both even-aged and uneven-aged management), as well non-harvesting management techniques, such as prescribed fire. For a more thorough description of these treatments, please refer to Appendix E.

Salvage Operations

Salvage harvests will be used to respond to incidents of high mortality in mature stands and decline in pioneer stands such as Virginia pine and black locust. High mortality or decline within mature stands are indicators for the forest managers to focus regeneration and final harvest efforts in these areas within the general forest zone to salvage economic value of the timber while reestablishing a healthy productive growing stock.

The primary purpose of salvage cutting is to remove dead, dying or damaged trees and, in some cases, stressed trees imminently threatened by forest pests, pathogens or abiotic factors. Intended to minimize financial loss of timber revenue, salvage harvests are generally a last resort effort, often unfeasible unless they are combined with silvicultural harvests of higher value timber (e.g., thinnings or regeneration cuts). Cost/benefit analysis of salvage feasibility must consider additional logging operational costs, timing, site access, safety and liability issues, and the stumpage value of salvage wood based on market conditions. Revenue from salvage harvests is

generally marginal. In some cases, salvage harvest can provide funding and justification for upgrading or creating access road networks. Aesthetics and wildlife habitat considerations should also be evaluated before the commencement of any salvage operation. Snags, cavity trees and fallen dead trees are all utilized by wildlife species including small mammals and song birds. Wildlife habitat requirements should be accounted for during the layout phase of any salvage operation. Utilizing similar procedures defined for traditional timber harvests, stands being considered for salvage will be visited and additional field data collected to assess economic and operational feasibility and to determine the potential ecological impacts and outcomes.

Pesticides and Herbicides

Given the stressors on desirable forest conditions, the safe use of pesticides and herbicides is a necessary and vital tool to maintain tree health and restore desirable tree regeneration, which is the foundational structural attribute influencing all other key ecological attributes (KEA) as specified in our KEA Report Card. Chemical use will be integrated with other strategies to protect forests from these health problems. Strategies include (but are not limited to) thinning to reduce stress and encourage canopy health, maintaining diversity of species, seedbed preparation through prescribed fire or physical means, fencing to reduce deer browse pressure. Current research and management experience provides sufficient justification for the judicious use of chemicals to achieve desired regeneration conditions. Chemical use in the streamside management zone (which includes buffer along perennial and intermittent streams and lakes) and in buffers around wetlands will be restricted to cases of significant infestations of riparian related species, and will use only herbicides labeled for use in riparian and wetlands. (Refer to Water Resources/Riparian Areas: Description and Approach, above.)

Forest managers have access to guidelines on how to minimize cost, chemical rates, and negative impacts on non-targeted species, while still obtaining desirable results on the target(s). These guidelines include: TNC's Global Invasive Species Team and Weed Control Methods Handbook; Herbicides and Forest Vegetation Management: Controlling Unwanted Trees, Brush, and Other Competing Forest Vegetation (Penn State CAT UH174, 2005). Evitts Creek Water Company will take an adaptive approach to utilizing pesticides and herbicides alone and in conjunction with other methods (e.g., prescribed fire, manual and mechanical removal) for controlling invasive species and low-shade producing vegetation.

Prescribed Fire

The Eastern Hardwood Forests are a fire-adapted ecosystem. This means that the plants and animals of this region have evolved to tolerate periodic wildfires. Historically, these wildfires would be low-intensity surface fires that occur every 25-50 years in a given area. As such, most of our native flora and fauna are fire-adapted species. There are some native species, however, that have evolved to be fire-dependent. These species actually require fire to propagate, compete, and flourish.

Occasional low-intensity wildland fires are a natural part of the Eastern Hardwood Forests, and have many benefits that are necessary to maintain a healthy ecosystem balance. Having frequent, small fires helps prevent the accumulation of large quantities of fuel, which can lead to detrimental high-intensity fires. Regular fires also encourage the regeneration of fire-adapted

species; such as oaks, pitch pine, and native grasses. Likewise, the rapid cycling of nutrients, as a result of these fires, helps fertilize the soil and aid plant growth.

(Comment from Nat. Heritage: The side-oats gramma grassland should also be discussed here. We suspect that a prescribed fire would significantly restore this site)

Wildlife can also benefit from periodic low-intensity fires. When these fires spread through the forest, they often leave behind a patchwork of burned and unburned areas. The result is a mosaic of different niches and species, in varying stages of ecological succession. This leads to a greater diversity of habitats and species. Some animals, such as ground-nesting birds, depend on the early-succession habitats that fire can create in order to reproduce.

Wildland fire can be ecologically beneficial when it occurs in the right place and under the right conditions. If implemented properly, prescribed fire is a valuable tool that can be used to create wildlife habitat, increase species diversity, protect threatened species, encourage regeneration of desirable plants, manage certain invasive plants, control forest succession, prepare sites for tree planting, and/or reduce hazardous fuels. However, prescribed fire can also be detrimental and dangerous, if it is used improperly.

Prescribed fire can only be effectively and safely utilized if it is overseen by trained professionals. These professionals must be properly equipped and knowledgeable of fire ecology and prescribed fire techniques. There also must be a written plan in place, which describes the desired outcomes, equipment and personnel needs, weather parameters, methods to be utilized, and safety precautions. A prescribed burn will only be successful if the objectives are SMART – Specific, Measurable, Achievable, Relevant, and Time-specific.

Annual Allowable Cut

A well-regulated forest allows for the removal of a percentage of total growth per annum. Having several harvests over a course of time is helpful in establishing actual harvested volumes compared to the estimated volumes obtained during inventory data collection. Since the forest at this time is not well regulated nor does it have an established average annual growth rate, it is recommended that over the next 3 to 5 years an annual allowable cut be set using actual volumes harvested and data collected from the established permanent plots measuring annual growth of the forest. By doing this over time, a sense of the growth rate of the forest can be better estimated.

Harvest Administration Procedures

The following outlines the general wood harvest operating procedures that will be used:

1. Based on the activity schedule in the annual forest work plan, the proposed harvest area is visited. Additional field data are collected to determine the development of advance regeneration and the amount of interfering stems present (referencing Silvah procedures and TUSAF guidelines). Ecological and archeological sensitive areas, visual impact areas, and special access requirements are also identified and delineated on maps and on the ground as appropriate.
2. If the quantity and quality of acceptable growing stock, volume, and/or advanced regeneration is sufficient to conduct a timber harvest, a harvest plan is drafted. The harvest plan will address skid trail layout, landings, and truck access, as well as special features on the sale area and any special harvesting equipment required. In general, the common harvesting system in the Ridge and Valley region involves professional loggers who are becoming mechanized and using harvesters (e.g., hydro-axes, Timbcos, and Bells) along with forwarders, grapple skidders, knuckle boom loaders and tractor trailers to make up their operations.
3. Controlling Erosion and Sediment from Timber Harvesting Operation (DEP) and Best Management Practices for Pennsylvania Forests (Penn State University) will provide operational guidelines for all activities in the harvest area. These guidelines are minimum requirements and the timber sale contract will impose specific requirements for each sale. Prior to marking trees for harvest, the location of all main haul roads and skid roads will be mapped. Sale boundaries will be flagged as necessary. Where possible, boundary lines will consist of property lines, existing roads and skid trails, and/or natural boundaries such as ridge-tops and stream courses.
4. In general, a combination of direct logged, per unit, and lump sum sales will be used to market timber.
5. As appropriate, prior to advertising the sale, adjoining landowners, hunt clubs, and affected farm owners will be notified, in person, by phone, and/or in writing to inform them of upcoming operations and to provide an opportunity to address their questions and concerns.
6. In most cases, all trees to be harvested will be marked with tree marking paint prior to advertising the sale. All stream channels will be evaluated in the field, since some may not appear on the USGS maps, and the riparian buffer zone adjusted for width as appropriate.
7. In general the sale will be awarded to the highest bidder. We reserve the right to reject bids based on bona fide prior knowledge of poor past performance of individual bidders. The contract will be signed, and the performance bond will be collected before commencing the timber harvest.
8. The timber buyer will be required to give notice as outlined in the contract as to when the harvest will begin and be present with their logging contractor at the pre-work conference. Location of skid trails, landings, and woods roads will be determined at the pre-work conference and no road construction or harvesting activities can begin until pre-work conference is completed and payments are current. In general, roads should be constructed as close to the time they will be used as possible.
9. Mid-term harvest inspections in addition to close-out inspections will be carried out as determined by the forestry consultant and/or ECWCo staff. A Contract Administration Checklist will be kept for each sale and made part of the sale folder upon close out.

Furthermore, a Harvest Inspection Form will be used to serve as a BMP checklist to which the contractor must adhere and any additional requirements stated in the contract.

10. The contractor will be encouraged to work the harvest from the back to the front to minimize damage to residual trees, and to close out all roads and landings as soon as they are no longer needed. If the contractor is removing equipment from the sale area, they must give ECWCo notice.
11. At the conclusion of all harvesting activities the buyer shall request a final inspection. At that time the forestry consultant will inspect the tract and accept the sale either as “completed” or “completed with conditions”. If weather conditions are not favorable for final close-out the sale may be temporarily closed with completion as soon as conditions improve.
12. After completion, a letter will be sent to the buyer with comments on the quality of the work. If the work has been acceptable the bid deposit will be returned.

Monitoring

Monitoring is crucial to the ability of the ECWCo to supply its intended sustained yield of a variety of forest resource benefits. At a minimum, the monitoring activities must meet current requirements for certification and reporting. Monitoring is necessary to document sustainable practices, provide information to adapt management, and carry out elements required for certification as a sustainable forest by the Forest Stewardship Council (FSC).

A high quality inventory and monitoring program that is linked to a GIS-based data management system is the key to a successful adaptive management program. It is, however, one of the often neglected or under-funded parts of a land management program.

Baseline and ongoing assessment of management and operations on ECWCo lands consists of water quality monitoring, ecological inventory and monitoring and operational and financial monitoring elements. The basic elements of monitoring on ECWCo properties are as follows:

Water Monitoring

Water Quality

Water Quality and other sampling parameters are monitored on a regular basis with the frequency of sampling dependent on the importance of the parameter. Locations where water may be sampled include intake structures, perennial streams into reservoirs, and in reservoirs themselves (from boats). Parameters that may be measured include pH, conductivity, dissolved oxygen, turbidity, phytoplankton, temperature, macro-invertebrates, and algae.

Operational/BMPs

Operational monitoring is designed to assess the program as an effective strategy for protecting soil and water quality on ECWCo land, to determine compliance with Pennsylvania Department of Environmental Protection Best Management Practices (BMPs), and adherence to other standards of operations as defined by the FSC US National Standard.

Emphasis will be placed on improving road conditions on infrastructure associated with active forest management. Individual harvest inspections are conducted periodically and the Forestry Harvest Inspection form is completed at least once a week during harvest operations. Additionally, at closeout, harvests are once again visited and the Inspection Form is completed to ensure all aspects of the harvest are completed to satisfaction.

Roads and Stream Crossings

ECWCo staff who frequent the properties on a regular basis will utilize the map layer of stream crossings to periodically assess primary and secondary road conditions while going about their normal duties. Ocular assessments will be performed to detect problems such as plugged culverts and help to identify potential issues, all of which will be recorded and reported for further evaluation and potential mitigation. In preparation for and following completion of forest management activities, including prescribed burning operations, impacted sections of the road network will be monitored at a higher frequency to assure functionality of water diverting devices and to confirm adequate vegetation establishment if necessary.

Ecological Monitoring

Inventory and monitoring protocols are designed to assess the influence of conservation actions on a set of nine Key Ecological Attributes (KEAs) measuring three major categories of forest health and condition – composition, structure, and regeneration. These KEA's were strategically selected to enable monitoring of forest condition at the management unit and tract level and enable tie-in of these attributes to monitoring at various scales. In addition, the presence of rare species and communities, non-native invasive plant species, and forest pests and pathogens are addressed through ECWCo's ecological monitoring, which is outlined in more detail below.

Inventory (Regeneration, Invasives, Species Composition, Healthy Snags – KEA)

A standardized forest inventory (i.e., timber cruise augmented with KEAs) will be used to monitor forest condition attributes at the management unit and tract level on ECWCo properties. Current state-of-the-art sampling methods will be used. A fraction of the permanent plots will be re-measured every 5-10 years.

Pre- and Post-Harvest Assessments

Prior to any harvesting activity, a field assessment will be conducted to quantify and document forest condition attributes necessary to ensure a successful treatment outcome. Factors that should be considered in preparation for a treatment include identifying the presence/absence of key non-native invasive plants and/or pest and pathogens within the planned harvest area and any existing roads/skid trails which will influence pre-harvest strategies and post-harvest monitoring. Reference can be made to TNC's Ecological Monitoring Field Form, or a similar form may be developed and used.

Heritage Triggers

Prior to any timber sale, prescribed fire, or road building activity, all efforts will be made to locate and map any rare species or communities (G1-G3, S1-S3) within ECWCo ownership. In

advance of any management activity, ECWCo staff will check the databases of the Pennsylvania Department of Conservation and Natural Resources (DCNR), Pennsylvania Game Commission (PGC), the Pennsylvania Fish and Boat Commission, Western Pennsylvania Conservancy (WPC), and the U.S. Fish and Wildlife Service to see if rare species or communities are likely to occur in stands proposed for the proposed activity. If necessary upon unique circumstances, such as findings of undocumented Rare, Threatened or Endangered species in the field survey, the appropriate agency will be notified. If surveys reveal rare species or communities, specific management and monitoring guidelines will be developed at the stand/harvest level to protect the species or community –OR- the proposed management activity will not occur.

HCV Monitoring

ECWCo will monitor for activities within or adjoining the HCV areas. Areas where concerns arise will be visited and checked, and any issues followed up on. HCV areas are also visited during periodic inventory procedures and changes tracked through the Key Ecological Attributes (KEAs) which are updated at 10 year intervals.

Continuous Forest Inventory

Continuous Forest Inventory (CFI) involves the establishment of well distributed permanently marked plots for periodic re-measurement, allowing foresters to track forest growth, mortality, stand structure and species composition changes in the forest over extended periods of time. This inventory system can provide valuable properties specific estimates of net growth, stand development and carbon capture that can be used to increase the accuracy of growth modeling and improve data for management decisions.

Social Monitoring

To engage with the community and to monitor stakeholder issues and concerns, ECWCo is actively involved with Evitts Creek Steering Committee meetings, which are open to the public. These meetings are used as a platform to proactively communicate with constituents and obtain feedback, enabling ECWCo to stay aware of community concerns and issues. Meetings are a method to inform the public of new or ongoing activities, including forest management operations. The integrated use of public meetings, the City's website, local newspapers, and relationships maintained by City and ECWCo employees promote a consistent, interactive dialogue with a broad set of stakeholders. ECWCo develops partnerships with local residents and users of the properties. Information is shared with each other to develop a better understanding of what is occurring on the properties.

- Quarterly meetings
- City Website
- Interaction w/ community
- Stakeholder meetings upon request

Additional Monitoring

Legal (boundaries, timber theft, dumping)

ECWCo is mandated by Commonwealth law to monitor and maintain the reservoirs and surrounding properties. ECWCo protects its properties through relationships that have been established with several Pennsylvania law enforcement agencies including the Game Commission, the Fish and Boat Commission, Bureau of Forestry, and the State Police. Where investigations identify those persons involved in timber theft, arson, illegal dumping, trespass by both foot and motor vehicle, and other violations, criminal complaints are filed through the use of the judicial system. Charges are filed under the PA Criminal Code Title 18 and PA Vehicle Code Title 75. Additional legal actions are brought when violations of the PA Game Code Title 34 are discovered. Evidence of these violations is given to the PA Wildlife Conservation Officers for prosecution.

Financial

Annual budget accounts for the expenses and revenues related to the management of its watershed properties. Expenses include those for professional consultants, deer fencing and herbicide treatment where prescribed, surveying and other miscellaneous expenses. Revenues are mostly from the sale of timber products.

Harvest Activities

Annual Allowable Cut (AAC) is the determination of timber volume that may be sustainably harvested from a forest management unit in a given year. ECWCo staff track the Annual Allowable Cut relative to harvest levels on an annual basis. Product sales are recorded and tracked in a paper file with receipts on an ongoing basis. The list of mills that have been sold to is also updated as needed.

FSC conformance

The TNC group manager completes an annual check of compliance with FSC standards. This is carried out over the phone with additional field visits scheduled every 2-3 years.

Appendices

Appendix A: Evitts Creek Water Company Legal Requirements

ECWCo, as owner/manager of the properties, have legal requirements that include but are not limited to the following:

International

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora)

Federal

U.S. Safe Drinking Water Act

U.S. Clean Water Act

U.S. Endangered Species Act

Pennsylvania

PA Safe Drinking Water Act

PA Clean Streams Law (Chapters 93, 102, & 105)

PA Conservation District Act

PA Prescribed Burn Laws (HB 262 and 2745)

PA Fire and Panic Act

PA State Game Laws (Title 34)

PA Fish and Boat Laws (Title 30)

PA Criminal Code (Title 18)

PA Motor Vehicle Code (Title 75)

Maryland

MD Safe Drinking Water Act

Local

Cumberland Valley Township Zoning Ordinance

Appendix B: Evitts Creek Historical Mapping Analysis Report

Joshua Skinner, 11/5/2015

Note: Joshua Skinner, a GIS student at Harrisburg Area Community College, completed this analysis and report during the fall 2015 semester.

The Evitts Creek study area has seen significant changes in the past 75 years. Early on there was a significant amount of farming as seen by the amount of fields present within the boundary. As time progresses fields start to become unkempt and become retaken by the forest. The largest decrease in field acreage came between the years of 1958 and 1967 with a total loss of 1,290 acres. 1939 to 1958 only saw a decrease of 882 acres (Table 1). Today there are only two or so fields located entirely within the boundary. Several other fields come in contact with the area but because only a small portion of the field is located within the boundary I did not take them into consideration. This trend holds true through all of the time periods under study as no new fields appeared. The same can be said for roads but they saw a much less intense of a decrease with only a few roads actually disappearing and others becoming dirt paths. Roads were buffered on the assumption that each lane is 9ft wide, so each road is 18ft across in total. The roads as a whole remain pretty constant in terms of acreage except in 1967 where it drops off but that could be due to bad photographs and not being able to see where they are. The number of buildings was fairly constant with only a few disappearing. However due to the quality of some of the earlier photographs it was difficult to determine if buildings actually disappeared when they did or if the quality of the photo was too low to get an accurate reading. The body of water in the middle of the boundary, Lake Koon, also saw a decrease in water levels between 1958 and 1967. The water levels seem to have stabilized in recent years but due to the nature of some of the photographs there is not enough data to perform a full analysis from this study.

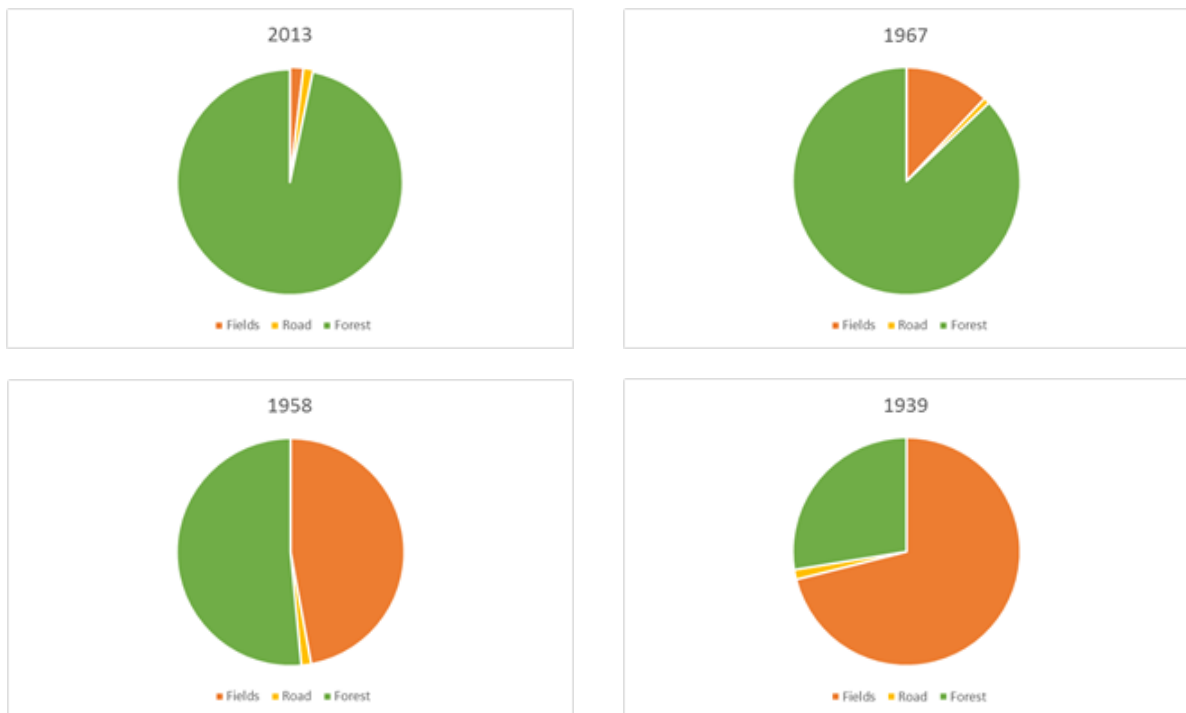


Table 1

I was able to run an interactive supervised classification on the more recent aerial imagery that I had access to. These photos were taken in 2013 by the NAIP and are downloadable for free on their website. The only stipulation was that I was not able to narrow it down to just what was within the boundary. See Figure 1 and Table 2 for reference. As you can see, water is listed at only being 2% of the entire photo but within the boundary I would estimate it is at 14% and the Fields category is 2%, with the remaining 82% forest. This is purely a visual estimation and another attempt at clipping the boundary out will need to be made in order to get the exact numbers.

I attempted to do a supervised classification for the other aerial photographs but because they were in black and white there was too much error present in the final results for me to include them.

In order to achieve these results I downloaded aerial imagery off of pennpilot.com. The Penn pilot photos were taken in the years 1939, 1958, and 1967 (See Figures 2a-c). The USDA's NAIP website was used for the present day imagery as of 2013 and they were all georeferenced using an ArcMap base map as a starting point. Then I procedurally digitized all of the features that I could locate within the photographs.

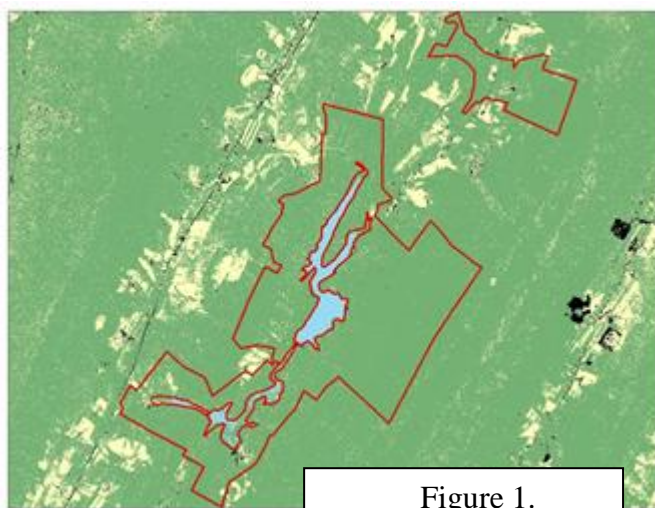


Figure 1.

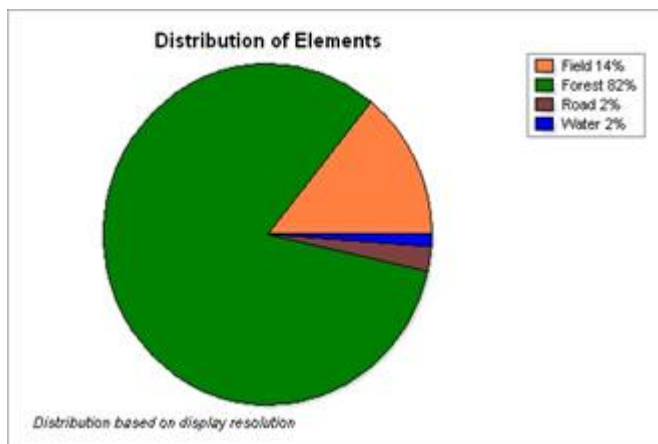


Table 2



Figure 2a: 1939



Figure 2b: 1958

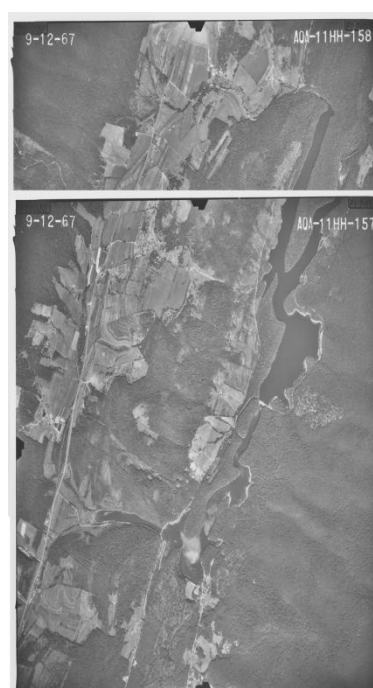


Figure 2c:

Appendix C: Site Soil Descriptions

Information accessed on the internet, January 2016. <https://soilseries.sc.egov.usda.gov/>

The two tracts of the Evitts Creek Water Company properties are comprised of approximately 61 different soil types, grouped into 35 soil series:

Albrights Silt Loam (Ab)

The Albrights Series consists of very deep, moderately well to somewhat poorly drained soil formed dominantly in regolith of colluvium or glacial till from reddish shale, siltstone and fine grained sandstone. They are on upland toeslopes, footslopes and drainageways. Slope ranges from 0 to 25 percent. Permeability is moderately slow. Mean annual precipitation is about 36 to 46 inches. Mean annual air temperature is about 48 degrees to 55 degrees F. Approximately 30 percent is cleared and in cropland and pasture. Wooded areas are mixed hardwoods, dominantly oaks.

Andover Cobbly Loam (Ar)

The Andover series consists of very deep, poorly drained soils formed in colluvium. They are on benches, toeslopes, footslopes, and swales along the base of prominent ridges. Slopes range from 0 to 15 percent. Permeability is slow. Mean annual precipitation is 42 inches. Mean annual temperature is 50 degrees F. Approximately 30 percent cleared for pasture and cropland, some of which is now idle. Woodland is mainly hardwoods of oak and hickory and small stands of hemlock and white pine.

Bedington-Berks Complex, Very Stony (Bd)

The Bedington series consists of very deep, well drained soils. Bedington soils formed in residuum from dark brown, gray and olive acid, sedimentary, siltstone and shale, with some sandstone interbeds. They are on nearly level to steep convex uplands and on the sideslopes of hills and ridges. Permeability is moderate. Mean annual precipitation is 42 inches. Mean annual temperature is 52 degrees F. Runoff is slow to rapid. Approximately 70 percent of the Bedington soils are in cropland and pasture. The remainder is in woodland or other uses. Principal crops are corn, small grain and hay. Wooded areas consist of oak, hickory, yellow-poplar and red maple.

For information on the Berks series, see below.

Berks Channery Silt Loam (Bk)

The Berks series consists of moderately deep, well drained soils formed in residuum weathered from shale, siltstone and fine grained sandstone on rounded and dissected uplands. Slope ranges from 0 to 80 percent. Permeability is moderate or moderately rapid. Mean annual precipitation is 42 inches. Mean annual temperature is 52 degrees F. Well drained. The potential for surface runoff is negligible to high. Depth to a seasonal high water table is more than 6 feet. Approximately 60 percent of Berks soils are in cropland and pasture, the remainder are in woodland or other uses. Principal crops are corn, wheat, oats, barley, Christmas trees and hay. Native vegetation is mixed, deciduous hardwood forest.

Blairton Channery Silt Loam (Br)

The Blairton series consists of moderately deep, somewhat poorly and moderately well drained soils on uplands. They formed in materials weathered from gray shale. They are on upland flats, depressions, and in drainage heads. Slopes range from 0 to 35 percent. Permeability is moderately slow. Average annual precipitation is 41 inches and the mean annual temperature is 52 degrees F. Somewhat poorly to moderately well drained. Runoff is medium to very rapid. Most areas of Blairton soils are cleared and in cropland or pasture. Woodlands are mixed hardwoods.

Brinkerton silt loam (Bt)

The Brinkerton series consists of very deep, poorly drained soils formed in medium textured colluvium derived from acid gray shale and siltstone. They are on footslopes of uplands. Slope ranges from 0 to 15 percent. Permeability is moderate in the surface layer, moderately slow in the upper subsoil, and slow in the fragipan and substratum. Mean annual precipitation is about 42 inches. Mean annual air temperature is about 52 degrees F. Poorly drained, with slow to rapid runoff. Wooded areas of mixed hardwoods consist of northern red oak, sugar maple, and black cherry with some hemlock and white pine. Cleared areas are chiefly used for pasture.

Buchanan Cobbly Loam (Bu)

Soils of the Buchanan series are very deep, somewhat poorly and moderately well drained, and slowly permeable. They formed in colluvium on mountain footslopes, sideslopes and in valleys that is derived from acid sandstone, quartzite, siltstone, and shale. Slope ranges from 0 to 45 percent. Mean annual precipitation is about 105 cm (42 inches), and mean annual air temperature is about 12 degrees C (53 degrees F). Runoff is medium to high. Permeability is moderate above the fragipan and slow in the fragipan. Woodland is the major use. Some areas are cleared and used for pasture, small grain, and row crops. Wooded areas are mixed hardwoods of oak, maple and ash.

Buchanan Cobbly Loam, Extremely Stony (Bw)

See above.

Clarksburg Silt Loam (Ck)

Soils of the Clarksburg series are deep, moderately well drained and slowly or moderately slowly permeable. They formed of colluvium on hill footslopes, toeslopes, sideslopes and backslopes that is derived from weathered, interbedded siltstone, sandstone and limestone. Slopes range from 0 to 25 percent. Mean annual precipitation is about 42 inches and mean annual air temperature is about 11 degrees C (52 degrees F). Runoff is negligible through very high. The major uses are for pasture, hayland, and row crops - mainly corn, soybeans, and small grains. Where wooded, it is chiefly mixed hardwoods, dominated by oak and maple.

Elliber Very Channery Loam (El)

The Elliber series consists of very deep, well drained soils formed in residuum weathered from calcareous shale, siliceous siltstone, silty chert, and cherty limestone. Slopes range from 3 to

50 percent. Permeability is moderate or moderately rapid. Mean annual precipitation is 42 inches. Mean annual temperature is 52 degrees F. Runoff is slow or medium. About one-third of these soils are cleared and cultivated and a large part is in orchards. Most of the remainder is in woodland or mixed hardwoods.

Ernest silt loam (Er)

The Ernest series consists of very deep, moderately well or somewhat poorly drained soils formed in colluvium derived from acid shale, siltstone, and sandstone. Slopes range from 0 to 50 percent. Permeability is moderate above the fragipan and moderately slow to slow in the fragipan and below. Mean annual precipitation is 43 inches. Mean annual temperature is 48 degrees F. Runoff is low to high. Much of the acreage of Ernest soils is cleared and used for pasture and crops. Some acreage is wooded. Where wooded, mixed hardwoods are present with some white pine and hemlock.

Hagerstown Silt Loam (He)

The Hagerstown series consists of deep and very deep, well drained soils formed in residuum of hard gray limestone. Slope ranges from 0 to 45 percent. Permeability is moderate. Hagerstown soils occupy valley floors and the adjacent hills. In some areas rock outcrops are common surface features. Most slopes are less than 15 percent but range up to 45 percent. The climate is temperate and moderately humid, with a mean annual temperature of 45 to 58 degrees F. and mean annual precipitation of 30 to 45 inches. Mean annual precipitation is 30 to 45 inches. Mean annual air temperature is 45 to 58 degrees. The potential for surface runoff is moderate to high. General crops, pastures, orchards, and truck crops. Large areas are in non-farm uses. Native vegetation is mixed hardwoods, including black walnut.

Hagerstown Silty Clay Loam (Hg)

See above.

Hazleton-Clymer Association, Extremely Stony (HT)

Hazleton soils are deep, well drained, nearly level to very steep, and generally extremely stony. Clymer Soils are deep, well drained, nearly level to moderately steep, and generally very stony. Most of this association is in woodland. The soils are well suited or very well suited to trees. Most private acreage is used for woodland production and for wildlife habitat and recreation. The main limitations to most uses are surface stoniness and the areas of steep and very steep soils.

Holly Silt Loam (Hy)

The Holly series consists of very deep, very poorly and poorly drained soils formed in loamy alluvium on flood plains. Saturated hydraulic conductivity is moderately high through high in the mineral soil. Slope ranges from 0 through 3 percent. Mean annual precipitation is about 36 inches, and mean annual temperature is about 51 degrees F. The potential for surface runoff is negligible through low. Subject to rare through frequent flooding. Some areas of Holly soils have been cleared and used for pasture or cultivation. Many areas are used as natural areas

for wetland wildlife habitat. Native vegetation is soft maple, elder, willow, and other trees tolerant of wet sites.

Laidig cobbly loam (Ld)

The Laidig series consists of very deep, well drained soils formed in colluvium from sandstone, siltstone, and some shale. They are gently sloping to very steep soils on benches and foot slopes. Permeability is moderate or moderately rapid above the fragipan and moderately slow or slow in the fragipan. Slope ranges from 0 to 55 percent. Near the type location, the mean annual precipitation is about 34 inches, and the mean annual temperature is about 51 degrees F. The potential for surface runoff is negligible to very high. Most areas are forested. Red, white, and chestnut oaks are the most common trees with some sugar maple, beech, and hemlock. A relatively small acreage of these soils is cleared and used for cropland or pasture.

Laidig cobbly loam, extremely stony (Lg)

See above.

Lobdell loam (Lx)

The Lobdell series consists of very deep, moderately well drained soils that formed in recent loamy alluvium. Permeability is moderate in the solum and moderate or moderately rapid in the underlying material. Slope ranges from 0 to 3 percent. Mean annual precipitation is about 38 inches, and mean annual temperature is about 50 degrees F. The potential for surface runoff is very low or low. Some areas of the soil are used for cultivation, chiefly corn, small grain, hay, and improved pasture. Other areas are in woodland or permanent pasture. The native vegetation consists of deciduous forest, chiefly beech, ash, elm, sugar maple, and sycamore.

Meckesville Gravelly Loam (Mc)

The Meckesville series consists of very deep well drained soils formed in colluvium, glacial till, or congeliturbate from red acid sandstone, siltstone and shale. They are on the concave sideslopes of upland ridges. Slope ranges from 0 to 60 percent. Permeability is moderately slow. Mean annual precipitation is 41 inches. Mean annual air temperature is about 50 degrees F. The potential for surface runoff is negligible to very high. Approximately 70% in woodland and 30% in cropland, pastureland, and idle land. Forested areas are dominantly oak, maple, and ash species.

Meckesville Gravelly Loam, Very Stony (Md)

See above.

Mertz Channery Silt Loam (Mh)

The Mertz series consists of deep and very deep, well drained soils formed in colluvial or glacial material derived from limestone containing various amounts of chert fragments. Slopes range from 3 to 35 percent. Permeability is moderately slow. Mean annual precipitation is 42 inches. Mean annual temperature is 52 degrees F. Runoff is medium or rapid. Most of these soils are cleared and cultivated to general farm crops. Wooded areas are in mixed hardwoods.

Monongahela silt loam (Mo)

The Monongahela series consists of very deep, moderately well drained soils in river valleys, treads, and risers, formed in old alluvium from acid sandstone and shale. Slopes range from 0 to 25 percent. Permeability above the fragipan is moderately high, and moderately low to moderately high in and below the fragipan. Mean annual precipitation is 45 inches. Mean annual temperature is 51 degrees F. Runoff is negligible to very high. Most of these soils are cleared and used for pasture, cultivated crops, and industrial and residential sites. Wooded acreage is generally limited, but where wooded common trees include red oak, white oak, yellow-poplar, sycamore, white pine, and Virginia pine.

Morrison Channery Sandy Loam (Mr)

The Morrison series consists of very deep, well drained soils formed in residuum of weathered noncalcareous sandstone. Slopes range from 0 to 50 percent. Permeability is moderate to moderately rapid. Mean annual precipitation is 43 inches. Mean annual temperature is 51 degrees F. Runoff is slow to medium. About 25% cleared and in general farm crops. Wooded areas contain mixed oak and some pine.

Morrison Channery Sand Loam, Very Stony (Ms)

See above.

Morrison-Murrill Complex, Very Stony (Mt)

For Morrison, see above. For Murrill, see below.

Murrill Channery Loam (Mu)

The Murrill series consists of very deep, well drained soils formed in colluvial materials derived from acid sandstones and shales and the underlying limestone residuum, on lower backslopes, footslopes, fans and benches. Saturated hydraulic conductivity is moderately high to high in the colluvial material and in the residual material. Slopes range from 0 to 55 percent. The mean annual precipitation is about 40 inches and the mean annual temperature is about 52 degrees F. Surface runoff potential is negligible to high. Much has been cleared and used for crops, orchards and pastures. Woodlands contain mainly hickory, yellow-poplar, ash, dogwood, elm, and beech.

Opequon-Hagerstown Complex, Very Rocky (Op)

The Opequon series consists of shallow, well drained soils formed in residuum weathered from limestone or dolomite, on the summits, shoulders, or backslopes of limestone uplands. Slopes range from 0 to 100 percent. The mean annual precipitation is about 40 inches and the mean annual air temperature is about 52 degrees F. Permeability is moderate to low. Runoff is negligible to very high. This soil series is largely in permanent pasture. In some areas, non-rock areas are used for crops. Where wooded, the vegetation is mainly mixed oaks. Cedars are common on unmanaged pasture and abandoned fields.

For Hagerstown, see above.

Penlaw Silt Loam (Pe)

The Penlaw series consists of deep and very deep, somewhat poorly drained soils formed in colluvium derived primarily from limestone but with some shale and sandstone. Slopes range from 0 to 15 percent. Saturated hydraulic conductivity is moderately low to moderately high. Mean annual precipitation is 43 inches. Mean annual temperature is 54 degrees F. Surface runoff is low to medium. About 90% is cleared and used for general crops or pasture. Wooded areas are in mixed hardwoods of oak and hickory.

Philo Silt Loam (Ph)

The Philo series consists of very deep, moderately well drained soils on flood plains. They formed in recent alluvium derived mainly from sandstone and shale. Permeability is moderate to moderately rapid. Slope ranges from 0 to 6 percent. The mean annual precipitation is about 43 inches and the mean annual temperature is about 52 degrees F. Subject to stream overflow. The potential for surface runoff is low or very low. Most areas are cleared and cultivated or pastured. Original vegetation was mixed water tolerant hardwoods.

Vanderlip-Rock Outcrop Complex (Vd)

The Vanderlip series consists of very deep, somewhat excessively drained soils formed in residuum of nonacid sandstone on ridgetops and sideslopes. Slopes range from 0 to 70 percent. Permeability is rapid. Mean annual precipitation is 39 inches. Mean annual temperature is 51 degrees F. Runoff is negligible to medium. Mostly in woodland of mixed hardwoods, dominantly oaks.

Water (W)

Indicates the presence of a water feature such as lake or stream.

Weikert Channery Silt Loam (Wk)

The Weikert series consist of shallow, well drained soils formed in material that weathered from interbedded gray and brown acid shale, siltstone, and fine-grained sandstone on gently sloping to very steep areas on uplands. Slope ranges from 0 to 100 percent. Permeability is moderately rapid. Mean annual precipitation is about 42 inches, and the mean annual air temperature is about 52 degrees F. The potential for surface runoff is negligible to high. Most is cleared and used for cropland and pasture or is idle. Forested areas are mixed, deciduous hardwoods.

Westmoreland Channery Silt Loam (Ws)

The Westmoreland series consists of deep and very deep, well drained soils formed from the residuum of weathered, interbedded siltstone, sandstone, and limestone on summits, shoulders, and backslopes. Slope ranges from 0 to 70 percent. Permeability is moderate. Mean annual precipitation is about 43 inches, and the mean annual air temperature is about 52 degrees F. The potential for surface runoff is negligible to high. Major uses include crops, woodland and pasture. Where wooded, is chiefly mixed hardwoods, dominated by oak and maple.

Wharton channery silt loam, very stony (Wx)

The Wharton series consists of deep and very deep, moderately well drained soils from residuum of interbedded clay shale, siltstone, and fine-grained sandstone on side slopes, nose slopes, head slopes, and crests. Slope ranges from 0 to 35 percent. Permeability is. Mean annual precipitation is about 53 inches, and the mean annual air temperature is about 49 degrees F. The potential for surface runoff is low through high. The major uses are hayland, pasture, cropland, and woodland. The dominant vegetation where wooded is mixed hardwood trees.

Appendix D: Contact information for Native American Tribes

(Feb 9, 2016)

The following Tribes have an interest in FHWA/PennDOT projects located within Bedford County:

Absentee-Shawnee Tribe of Oklahoma

Carol Butler
Tribal Historic Preservation Office
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee, Oklahoma 74801
Phone (405) 275-4030 ext. 302
Fax (405) 878-4533
E-mail carol.butler@astribe.com

Contact Joseph Blanchard with any questions.

Cc: Joseph H. Blanchard (cc on everything! even emails!)

Cultural Preservation Director/
Tribal Historic Preservation Officer
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee, Oklahoma 74804
Phone (405) 275-4030 ext. 303
E-mail joseph.blanchard@astribe.com

Cc: Governor Edwina Butler-Wolfe (cc on everything via emails!)

E-mail edwinab@astribe.com

Delaware Nation, Oklahoma

Jason Ross
Delaware Nation
PO Box 825
Anadarko, OK 73005
Phone (405)-247-8903
Fax (405) 247-8905
E-mail jross@delawarenation.com

Delaware Tribe of Indians, Oklahoma

Susan Bachor
Delaware Tribe Historic Preservation Representatives
P.O. Box 64
Pocono Lake, PA 18347
Phone: 610.761.7452
Email: temple@delawaretribe.org

Eastern Shawnee Tribe of Oklahoma

Robin Dushane
Cultural Preservation Officer
Eastern Shawnee Tribe of Oklahoma
P.O. Box 350
Seneca, MO 64865
Phone (918) 666-2435
Fax (918) 666-2186
E-mail rdushane@estoo.net

Oneida Nation of Wisconsin

Corina Williams/ THPO
Oneida Nation of Wisconsin
P. O. Box 365
Oneida, WI 54155-0365
Phone (920) 496-5386
Fax (920) 490-2099
E-mail cwilliam@oneidanation.org

Seneca-Cayuga Tribe of Oklahoma

Paul Barton, Historic Preservation Officer
Seneca-Cayuga Tribe of Oklahoma
23701 S. 655 Rd
Grove, OK 74344
Phone (918) 787-7979
Fax (918) 787-9440
E-mail pbarton@sctribe.com

Shawnee Tribe (of Oklahoma)

Section 106 and projects, Environment/NEPA:
Kim Jumper, Tribal Historic Preservation Officer
Shawnee Tribe
29 South 69a Highway
Miami OK 74354
Phone (918) 542-2441
Fax (918) 542-9915
E-mail Kim.jumper@shawnee-tribe.com

(cc. for Section 106 projects):

Ron Sparkman, Chairman

Shawnee Tribe

29 South 69a Highway

Miami OK 74354

Phone (918) 542-7774

Fax (918) 542-2922

E-mail ronded@gmail.com

Appendix E: Description of Silvicultural Techniques that may be used on ECWCO Properties

Intermediate Treatments/Tending Improvement Thinning – A mid rotation harvest designed to control the structure, spacing and species composition of the forest stand by removing or killing designated trees. In a commercial thinning the value of trees removed more than covers the costs of treatment, whereas in pre-commercial TSI (Timber Stand Improvement) an investment is necessary to accomplish the treatment. Stocking Guides (such as Roach and Gingrich, 1962) are used to guide spacing and stocking control, reducing treated stands to a condition where the leave trees (trees left on the site) adequately occupy the site in a free to grow state. Leave trees are selected based on good health and form, species, good crown condition, spacing, timber value potential, wildlife or biodiversity value, and seed tree potential. Marking decisions must necessarily be adapted to the composition and condition of the stand such that a threshold for suitable leave trees in a degraded stand is necessarily lower than that of a fully stocked, healthy forest with abundant acceptable stems.

Crop Tree Release - An intermediate treatment focused on the individual trees favored to grow to maturity based on timber, wildlife or ecological value. Normally a target of crop trees per acre is established and designated trees have a crown release thinning on 3-4 sides of the crown to increase vigor and growth rates of the crop tree. There is no prescribed treatment to intermediate areas between crop trees although a modified approach could combine improvement thinning guidelines in these areas with full crop tree release for the subject trees.

Salvage/Sanitation Thinning – A thinning in response to major episodes of mortality or forest stress where harvest decisions are based on evaluations of tree health or risk potential. Salvage harvesting is by definition reactive and not typically a predictable component of forest management planning, but it is a common strategy as more and more introduced insect and disease threats stress our forests along with natural storm damage or drought stress. Dead trees are typically removed along with stressed trees which are unlikely to survive or fulfill management objectives. For instance, an oak tree with over 50% of the crown exhibiting dieback from gypsy moth defoliation will not be able to rebuild its crown and provide adequate growth or acorn production and so should be salvaged. Along recreation areas or trails, dead trees and hazard trees might be removed to increase safety and reduce ongoing maintenance needs.

Free Thinning - Free thinning is not a specific stand treatment but rather a hybrid which recognizes the variable characteristics within the stand and the multiple objectives of landowners. In free thinning the forester reduces stocking within traditional stocking guidelines but may drift between different selection criteria based on the opportunities presented by changing stand characteristics. For instance, given wildlife habitat and timber value growth objectives in a mixed oak stand, a forester may thin out red maple in one area to free up oak crop trees, remove overtopping isolated pine in another area to favor oak, resort to clustered group selection where oak seedlings are well established and daylight an isolated grape vine crop tree. Variability within stands is increasing within our landscape due to increasing pockets of insect/disease mortality, patchiness of seedlings, old diameter limit cutting, and inherently variable soil conditions within our glaciated landscape. Modifying conditions to improve stand performance against goals is therefore a necessarily “uneven” approach although the outcome should always strive to improve conditions and reduce variability where possible.

Forest Regeneration Treatments

Shelterwood harvest – One of the most common regeneration treatments in eastern hardwoods, the shelterwood is designed to control stocking, seed and sunlight so as to favor establishment of natural seedling regeneration under a “shelter” of partial canopy. This is a staged approach which could actually start with a thinning to favor certain seed producers and stir up the seedbed, followed 5-15 years later by a shelterwood harvest which opens the canopy and reduces stocking to 40-70 sq ft of basal area (30-50% of full stocking), and ending with a removal harvest to release the seedlings and reduce the overstory to 30 sq ft or less which effectively turns site resources over to the new forest represented by the seedling/sapling age class. If forest stands exhibit adequate seedlings the pace of the shelterwood progression can be shortened or stages skipped whereas it can be halted if seedlings are slow to establish or plagued by deer browse. The actual shelterwood harvest should retain healthy dominant and codominant trees of favored species such that suitable seed continues to be deposited into the seedbed. Almost all of the suppressed or midstory stocking should be removed to maximize sunlight on the forest floor while retaining maximum seed production, especially when oak, cherry and other species intolerant of shade are desired.

Seed Tree, Clear cut w/ Residuals, Two Aged – These are all terms for the final harvest to release seedlings to conditions of relatively full sunlight for rapid height growth. Most local hardwood species do not rely on the seed production and dispersal conditions created by the true seed tree silviculture, but it can be used to maintain species representation, protect nesting or perching sites, supplement already established advance regeneration, or address aesthetic concerns. The clear cut w/residual terminology is used commonly with the state forest management and the two aged management is a forestry term which has been recently adopted by wildlife managers to encourage residual seed production over thick cover conditions for species such as ruffed grouse or golden winged warblers. Residual stocking should be reduced to no higher than 25-30 sq ft of basal area to maximize light and insure a new forest can take hold, the primary objective of this treatment.

Group Selection – A patchy treatment designed to create sunlit openings which mimic the partial openings created naturally by blowdowns, insect mortality, etc. For oak management, it is recommended that the harvest remove groups of trees in an area with a diameter roughly equal to 1-1.5X the height of the timber at a minimum. This treatment can be adapted to react to the natural establishment of seedlings by focusing treatments around pockets of seedlings. Areas between openings can be treated by thinning, salvage or left untouched. In practical terms, this is rarely a primary strategy in regional silviculture, but can be appropriate in special circumstances to deal with inherent patchiness, encourage regeneration without drastic harvesting in sensitive areas, or create specialized wildlife habitat conditions.

Coppice Regeneration - This treatment is restricted to species which exhibit root sprouting but can be a valuable habitat management tool in our region, especially where aspen management is possible. Both quaking and bigtooth aspen have a propensity to put up root sprouts which can emerge 20-30 feet distant from a cut stump. Aspen is also a preferred food supply for grouse (buds and flowers), deer (twigs), rabbits, hares and beavers (bark). The regenerating thickets provide excellent habitat for grouse, woodcock, black bear and other species. Harvesting should be accomplished in dormant growth periods when the trees' energy reserves are stored in the roots. Harvesting should be complete and over as large an area as

possible to provide maximum sunlight and significant habitat features for target wildlife species. The forester should evaluate need for protective deer fencing as aspen is a preferred browse species of deer and excessive browse will kill shoots and starve the root system of needed energy, eliminating the aspen component from the future forest.

Prescribed Fire – An old tool which fell out of favor as the forestry community sought to control wildfires, prescribed fire is emerging as a critical missing component of management within several of our regional forest communities. It can play at least three distinct roles in regeneration of vegetation:

Ecological Restoration to reestablish vegetative communities adapted to the presence of fire. Used in this manner, a prescribed burn is designed to consume much of the vegetation in a fairly mature community and stimulate sprouting, seed germination and recycling of nutrients to reestablish a new community adapted to the presence of fire. This can have benefits in maintaining critical habitats necessary for plants and animals adapted to these ecosystems and can also benefit game management for hunters as the quality of food and cover and the matrix of game habitat is improved through prescribed burns.

Create receptive seedbeds conducive to germination of forest seed. Acorns germinate best when the duff layer of dead leaves and debris is not excessive. Other seed is stimulated to germinate by warming soils or chemical changes brought on by a fire which consumes the leaf litter, vegetation and debris which builds up on the forest floor. By running a modest fire through the understory, conditions for better regeneration can be created. However, each situation can be different and occasionally, unwanted species such as hayscented fern may flourish in the aftermath of a fire, especially where an elevated deer herd is drawn to the site to feed on the succulent regrowth and eliminate desired vegetation.

Prescribed burning also has utility in manipulating the composition of forest regeneration. Once forest seedlings and saplings are well established following a disturbance or harvest, a well-timed prescribed fire could have a major impact on the species represented in the future forest. This situation probably existed over much of the Poconos last century where periodic burning of forest regrowth maintained a thicket type composition which shifted drastically to the species such as oak, chestnut and hickory adapted to fire and capable of resprouting after each burn. Other species such as white pine, birch, cherry and red maple may have germinated after a harvest or fire but will be effectively removed in a subsequent fire. To execute this treatment, the oak seedlings should be several years old, well established and able to withstand a moderate fire.

Additional benefits could include encouraging pockets of herbaceous regrowth and prolonged periods in the seedling establishment stage recommended for the golden winged warbler and certain game species. Another benefit of prescribed fire not related to silviculture or ecological management is the removal of fuel build-up and the risk of more catastrophic fires during severe droughts or excessive winds when control is very difficult. By maintaining firebreaks and burning excessive fuel buildup in blocks within the landscape, wildland firefighting has better options to attack wildfires when they do occur.

Herbicide Applications – Typically used where understory competing vegetation has become so established it interferes with establishment of preferred species. Typical species that

are addressed with herbicide include rhizomous ferns such as hay scented and New York fern, beech sprouts, striped maple or sweetfern. Herbicides are applied by a certified applicator using equipment that can include skidder mounted mist blowers, backpack sprayers, or bark injection or application. Chemicals approved for forestry applications at prescribed concentrations and under proper weather conditions pose little environmental risk. Typical herbicides used in these forestry applications include glyphosate (ROUNDUP), sulfometuron methyl (OUST), and triclopyr (PATHFINDER). Several scientific papers on environmental risks are included in the Appendices. When evaluating impacts, the surfactant or “sticker” used to improve the effectiveness of the herbicide also needs to be considered as it can be a larger issue than the active ingredient. This is especially true around wetlands and open water. It should be pointed out that forestry applications for herbicide use only occur on a small subset of total forest management acres and typically only once within the 100 year rotation age of the forest and are therefore a much smaller volume than agricultural or residential applications.

Deer Fencing – An enclosure fence at least 7 feet tall which attempts to protect developing seedlings from excessive browse pressure exerted by local deer herd. Deer fencing is typically woven wire fencing attached to residual trees or fence posts and installed immediately before or during the regeneration harvest sequence. Costs include \$2.30-2.80/lineal foot to construct, ongoing maintenance costs and another \$0.50-0.75/lineal foot to dismantle. Fences normally need to remain in place for anywhere between 4-12 years depending on the success of the seedlings establishment. Longer periods can increase quality and diversity of growth within the fence but are offset by increasingly problematic maintenance challenges. Since the costs could total \$375-\$600/acre or more, forest managers should thoroughly evaluate the need, shorten the critical period of fencing to minimize maintenance costs, focus on controlling the deer herd to avoid the need, and increasing alternate food supplies/habitat quality to bring better balance to the deer population and its habitat. This becomes increasingly challenging in mixed landscapes with residential developments where deer find refuge and food, including food provided by people who enjoy seeing and protecting the local herd.

Miscellaneous Treatments

Food and Cover Plots - Food plots are a wildlife management tool that can improve forage opportunities, sightings, and hunting opportunities of game species and add diverse habitat characteristics for non-game species. Cover plots establish taller grass species which provide escape and nesting cover for birds and small mammals. Old log landings, access road corridors, old fields and disturbed areas such as retired sand and gravel pits all present opportunities for establishing planted plots. Any planting should be adapted to the soil and sunlight conditions and based on soil tests to address any needs for lime and fertilizer applications at planting and for ongoing maintenance. Mowing or burning may be needed periodically to maintain plantings and "no-till" agricultural techniques can be used to re-establish plots with minimal soil disturbance.

Appendix F: Additional Background on Riparian Forests and Vernal Pools

Wildlife Values in Riparian Forests

Wooded buffer zones along streams and rivers can be classified as riparian forest. Riparian forests differ from upland forests in their hydrology, plant community, soils, and topography. These features determine the potential abundance of animal populations.

The riparian forest supports a greater diversity of wildlife than nearly all non-aquatic areas or upland forests. The reason for this is because of the numerous habitat features found in these areas. Forested riparian corridors function as connectors between isolated blocks of forested habitat. Riparian forests are often surrounded by low quality wildlife habitats and therefore support higher densities and diversities of migratory birds. This is because these bird populations cannot feed in the surrounding habitat. In agricultural areas where extensive forests are not present, riparian forests provide critical habitat and may be the only edge cover available. Snags are used as den sites by cavity nesters. Root systems of wood vegetation not only help stabilize banks, but supply cover for fish and aquatic insects.

What are Vernal Pools?

Vernal pools are unique and vulnerable kinds of wetlands. They are usually ephemeral (temporary) pools that fill with snowmelt and spring run-off, and then dry out sometime during the summer. However, vernal pools also include pools that fill at other times of the year. Many of these pools are vital breeding habitat for certain amphibians and invertebrates such as wood frogs and spotted and blue spotted salamanders. What makes vernal pools such excellent breeding habitat is the seasonal nature of the pools that excludes fish populations that would prey on the offspring. Vernal pools are not only used for reproduction, but other species such as spring peepers, gray tree frogs, and a number of bird species use pools for feeding and resting as well. These important wetlands are some of the most vulnerable because they are small, isolated, and often dry, therefore unrecognizable. Frequently, they are easily destroyed or damaged because they are small or dry.

Vernal pools not only provide vital habitat for local plants and animals, they are also important features in the landscape. Think of pools as islands in a sea of upland forest. Groups of pools form stepping stones of hospitable habitat for wildlife that are dependent on wetlands to travel. Animals may skip over one pool to find a more suitable one nearby. If the wetland mosaic of pools within an upland community is altered, wildlife populations may be isolated and more vulnerable to changes in their surroundings. Suitable pools must have enough leaf litter and other debris to provide food sources and cover for the species that breed in them.

Wildlife in Vernal Pools

Wood Frogs

Wood frogs are terrestrial except during the breeding season. They live in woodlands, where they forage for food among leaves and debris on the forest floor. In winter, they hibernate under rocks, moss, leaf litter, or in rotting logs and stumps. Wood frogs are often the first amphibians to emerge in spring, at which time large numbers of males and females migrate to breeding sites during the first warm rains (from late March to late April). One easy way to locate

vernal pools is to listen for wood frog choruses, which are groups of males singing to attract females. Wood frogs make a sharp clucking sound, and large groups can sound like ducks quacking or outboard motors idling.

Breeding is completed within a couple of weeks, after which adults return to the woods, leaving clear, jelly-like egg masses behind. Eggs will hatch into tiny tadpoles in about three weeks, depending on water temperature. Tiny wood frog tadpoles grow and eventually metamorphose into juveniles after an average of 67 days. The juveniles, which look like miniature adults, gather in large groups along the shore of the pool before dispersing into surrounding woodlands.

Spring Peepers

Spring peepers may use vernal pools for breeding, in addition to just about any pond, ditch, or other small water body. These frogs also breed in early spring, but choruses of males produce high-pitched peeps, very unlike the mechanical clucking of wood frogs.

Green Frogs & Bullfrogs

Later in the summer, green frogs and bullfrogs may seek out vernal pools to feed on eggs and tadpoles. These species do not breed in temporary water bodies, as their tadpoles need to stay in the water for over a year before they reach metamorphosis. Bullfrog tadpoles do not metamorphose into terrestrial forms until they are three years old.

Salamanders

Several salamanders also breed in vernal pools. Spotted, Jefferson's, and blue-spotted salamanders all arrive at pools around the same time as wood frogs, between mid-March and late April. These species are known as "mole" salamanders because of their subterranean lifestyles. Mole salamanders spend most of their lives in underground rodent burrows and tunnels and crevices under rocks and other debris. Adults emerge from their underground homes and migrate to vernal pools during the first warm, rainy evenings of spring. Although their breeding season may last a few weeks, males and females in any given pool complete courtship, mating, and egg-laying in just a few days.

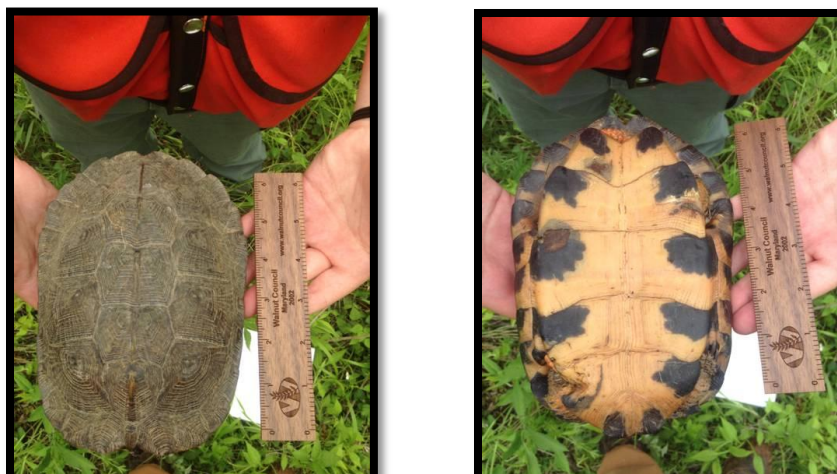
Female salamanders attach their eggs to branches, logs, and other underwater structures, after which they leave the pools and go back to their underground homes for the rest of the year. Mole salamander egg masses look like clear or opaque globs that are made up of many eggs, each with a tiny dark embryo within. These embryos hatch in three to five weeks, depending on water temperature. Salamander larvae have feathery external gills and four legs, which distinguish them from frog larvae, which have internal gills and no legs. Larvae metamorphose by late summer, when they are about 2 to 2.5 inches long, and leave the pools to find underground homes in surrounding uplands.

Other salamanders that may be found in vernal pools include the eastern spotted newt and four-toed salamander. Newts typically live in permanent water, such as ponds and lakes. Their larvae metamorphose into terrestrial juveniles known as "red efts," which travel on land for two to seven years before returning to water to breed. Some individuals may select a vernal pool in which to transform into their aquatic adult phase. Four-toed salamanders do not lay their eggs in

pools, but attach them to rocks, logs, or moss clumps directly over the water. Hatching larvae fall from the egg mass directly into the pool.

Spotted and Wood Turtles

Spotted and wood turtles may use vernal pools during the breeding season of wood frogs and mole salamanders. These turtle species wander extensively on land searching for food during the spring, summer, and fall. In early spring, they seek out vernal pools to take advantage of the amphibian and invertebrate eggs and larvae in them. Relatively deep vernal pools may serve as overwintering sites for some spotted turtles.



Wood turtle observed on Evitts Creek Water Company property during forest inventory, summer 2015.

Threats to Vernal Pools

Land-use adjacent to pools affects their value as productive amphibian breeding sites. The loss of surrounding trees results in decreased shading, rising water temperatures, decreased oxygen content, increased evaporation, and shorter flooding cycles. There may also be less debris to provide cover, nutrients, and attachment sites for egg masses. Many of the amphibians and reptiles that use vernal pools spend most of their year in the surrounding habitat, both uplands and wetlands. For example, spotted salamanders spend much of the year under leaves on the forest floor. Wood frogs and salamanders may come to breed in vernal pools from as far away as 1000 feet, and turtles from even farther. They are usually reluctant to cross large areas of lawns or fields. Changes to the forest surrounding a vernal pool, such as clearing trees, putting down sod, or building and paving, will have a detrimental effect on the species that use the nearby pool. Roads provide a lethal barrier to many species that must cross it to reach a vernal pool. Heavy traffic on the rainy nights when salamanders and frogs migrate can cause a great deal of mortality and effect local populations. Road salt and other chemicals from the road may also have an effect on the water quality in nearby vernal pools. In short, the upland area around the pool is just as important to these species' survival as the vernal pool itself.

Appendix G: Forest Inventory Methods and Techniques

Baseline Inventory Specifications for Working Woodlands 2012

Established March 3, 2009; Revised July 5th, 2011

Revisions for Cumberland Watershed Data Collection in RED

Cruise Design and Statistical Standards

- 1.) Sampling Method: 10 Basal Area Factor Variable Radius Plot inventory, with point centers occurring on a systematic “line plot” grid system established at a random starting point within each strata.
- 2.) Statistical Standard: Mean volume estimates (e.g., board feet and above ground carbon per acre) for the ownership will be reported with a minimum statistical accuracy of 90% confidence +/- 10% error from the mean. These objectives may be adjusted for more or less accuracy based on a properties-specific analysis of data collection cost relative to return.
- 3.) Stratification/Sampling Intensity: Forest Compartments are approximated prior to the inventory through digitization within a GIS by referencing aerial photography, historical management plans, documented past management activities, and ground based surveys. Inventory sample spacing will be determined based on the variability of the properties attributes (e.g., species composition, soils, topography, etc.) and what is needed to achieve a desired level of statistical accuracy and confidence (see #2 above). Plot spacing will be determined by Working Woodlands program managers prior to data collection and adjusted accordingly throughout the inventory process to achieve desired statistical accuracy. Sampling intensity has typically averaged approximately one plot per 5 acres (7 chains by 7 chain grid) within the project region. **The second plot in each stand will be designated as a permanent plot. A wooden stake is to be installed at plot center. A bark scribe mark is to be made at DBH on all “in” trees for the plot.**
- 4.) Sampling Frequency: Full tract-level inventories will be conducted at ten-year intervals. Monitoring will typically occur on five-year intervals, however monitoring frequency will relate to the rate and magnitude of forest management activities. Traditional pre and post harvest monitoring techniques will be employed to inform land managers of potential needs to implement a more comprehensive (statistically accurate) monitoring of carbon pools (refer to Pearson, Brown, Birdsey 2007).
- 5.) Data Collection: It is preferred that all data will be collected on hand held Pocket PC data recorders incorporated with Pocket Dog data collection software, then downloaded and compiled on Office Dog. In select cases field

data can be collected on paper tally sheets and manually entered into either Pocket Dog or Office Dog for data analysis.

Field personnel will use the following equipment for obtaining forest, carbon, and wildlife inventory data:

- Spencer 75' Logger Tape designed to measure in 10ths of feet
- Suunto Clinometer with percent and topographic scales
- Jim-Gem 10 Factor Prism
- Silva Ranger Compass
- Garmin GPS handheld unit

Field Procedures

- 1.) Cruisers will adjust compasses for magnetic declination relevant to the tract.
- 2.) All sample points will be located as close as possible to the corresponding map point. At each point the cruiser will hang flagging at eye level above each sample plot and as close to plot center as possible. The flagging should be labeled with the plot number and initials of the cruiser. A select number of overall sample points will be designated as permanent plots for monitoring purposes. At points designated as permanent plots, the cruiser will place a rebar stake and a fluorescent colored whisker pin in the ground at point center, GPS the coordinates, and hang flagging at eye level above each sample plot with plot number and cruiser's initials labeled on it.
- 3.) Sample point locations will be located as accurately as possible in correspondence to the cruise map. In the event a sample point falls within less than 1 chain of a map-able non-forest type or unproductive area the point will be relocated back, forward, or perpendicular to the line of travel until it is at least 1 chain away from the non-forest type. If the relocation of the sample point in either direction is still infringed upon by the non-forest type, the sample will be taken at a location least infringed upon by the non-forest type. A sample point may be excluded from the inventory only if a reliable sample can not be obtained after all measures of relocating the sample point have been made. Pertinent notes shall be made within the Comments section for the sample point on the PDA with respect to the relocation or exclusion of the sample point.

Non-forest or unproductive types, either mapped or unmapped, include roads, power-lines, pipelines, bogs, water bodies, fields, open wetlands, beaver flows, barrens, rock outcroppings, etc.

In the event a point falls within 1 chain of a boundary line, the point will be moved back along the line of travel to a point 1 chain from the boundary. The cruiser will note any such adjustments to sample point location in the Comments section for that tally point.

- 4.) At each sample point, milacre regeneration plots are to be completed FIRST, so as to avoid trampling of seedlings. After milacre regeneration plot is completed, beginning with the first tree directly in line with the line of travel then proceeding in a clockwise direction, each tree greater than 1.5" dbh and falling within the 10 BAF variable radius plot will be measured and tallied. All borderline trees will be determined to be "in" or "out" by calculating the limiting distance of each borderline tree with slope corrections applied as necessary.

Limiting Distance for all borderline trees will be determined using the following method:

- a) Measure, from the uphill side, the diameter (dbh) of the borderline tree to the nearest 0.1" (inch) and mark the point at which the measurement was made with a paint stick.
- b) Measure to the nearest 0.01' (1/100th foot) the horizontal distance from the face of the tree (at dbh) to point center. Cruisers will record the point number, observed forest cover type, size class, and density classification at each sample point location. Any other pertinent notes relevant to stand conditions including health/vigor will be recorded in the Comments section for each sample point.
- c) Calculate the limiting distance of the tree by either a) multiplying the diameter of the tree by the 10 BAF Conversion Factor of 2.708, or b) using a lookup table of plot radii for trees of different diameters for a 10 Basal Area Factor prism. If the resulting distance is greater than the measured horizontal distance then the tree is "in" and will be recorded in the tally. Conversely, if the measured distance is greater than the calculated limiting distance then the tree is "out" and is not to be recorded.

NOTE: Adjustments to correct for slope when determining limiting distance of borderline trees will be made by sighting a clinometer on a point at eye level upon the tree in question and recording the percent slope. Determine the Slope Correction Factor from the conversion table and multiply this figure by the limiting distance of the tree to calculate the slope corrected limiting distance. Then, measure the distance, parallel to the slope, from the face of the tree to point center. If this measurement is less than the slope corrected limiting distance the tree is "in" and recorded in the tally.

Conversely, if the measured distance is greater than the slope corrected limiting distance the tree is “out”.

5.) The following information will be recorded on the PDA for all trees tallied at each sample point location.

A. Species (**SP**), from the specified Species Code List incorporated within each PDA unit for Pocket Dog.

B. Product Code (**PROD**) for each tree tallied is to be recorded as per the code list provided within the Data Collection Summary listed below.

C Diameter (**DBH**) measured at a point 4.5’ above the ground (dbh) on the uphill side of the tree. Diameters will be

measured with a diameter tape. All trees 2.0 inches dbh and larger will be recorded by ~~two (2) inch~~ one (1) inch diameter classes as

follows:

Diameter Range	Diameter Class
1.6” – 2.4”	2”
2.5” – 3.4”	3”
3.5” – 4.4”	4”
4.5” – 5.4”	5”
5.5” – 6.4”	6”
6.5” – 7.4”	7”
7.5” – 8.4”	8”
etc.	etc.

D. Height (**MHT**).

Sawtimber: record the number of 16’ logs (minimum ½ log) to the nearest ½ log to a minimum top diameter of 10 inches or to a point where the tree no longer meets USFS grade 3 specifications due to forks, crook, excessive sweep, defect, etc. Record all ½ logs as a 5 (i.e. 1½ log tree = 15).

Pulpwood: record the number of 16' logs by estimating the number of 8 foot bolts contained in each merchantable stem to a minimum top diameter of 4" or to a point where the tree becomes un-merchantable due to forks, defect, etc. Individual trees must contain at least one 8' bolt.

***Minimum Standards for Diameter and Height:** Sawtimber trees must be 11.5" dbh or greater and contain at least 8 feet of grade 3 log (10" minimum top diameter) anywhere in the stem. Pulpwood trees must be at least 5.0" dbh or greater and contain at least one 8 foot bolt to a 4 inch top diameter. Snag trees must be at least 5.0" dbh and at least 5 feet tall. Coarse Woody Debris must be at least 10 centimeters in diameter measured at point of line intercept and does not have a minimum length requirement.

- A. Defect (DFC) will be recorded as a percentage within the given tree by increments of 5%. For a tree with no defect (100% sound), no entry will be made. A tree with 5% defect is recorded as a 5, a tree with 10 % defect is recorded as a 10, and a tree with 15% defect is recorded as a 15, and so on.

Determinations for defect will be made using Table A provided below.

- B. Text Data Fields. Upon completing data collection for trees, course woody debris, and regeneration for each sample point, secondary data shall be recorded within the Text Data Fields, of which include Wildlife Habitat, Competing Vegetation/Interference, and Deer Impact. Observations about the surrounding stand area including forest cover type, wildlife habitat, density and size classification will be made and recorded as per the criteria set forth within the Data Collection Summary listed below.

Data Processing

All inventory data will be downloaded, processed and compiled by The Nature Conservancy using TwoDog's OfficeDog software. This will allow for the data to be easily converted to other formats for additional analysis pertaining to Carbon Offset credits if desired. For the purposes of processing and evaluation the sample will be considered a random sample. All sawtimber shall be reported in MBF (thousands of board feet) in the International 1/4" log rule. All pulpwood shall be reported in tons. Listed below are the form classes to be used for sawtimber volume computations in the TWO DOG 2.0 program:

<i>TNC -</i>	Form
<i>Species</i>	Class

America	78
n Chestnut	
Aspen	78
Basswoo	78
d	
Beech	82
Birch	79
Black	80
Cherry	
Black	78
Locust	
Black	79
Oak	
Black	80
Walnut	
Blackgu	78
m	
Black	80
Spruce	
Chestnut	78
Oak	
Cucumbe	80
r Tree	
Dogwoo	78
d	
Elm	78
Green	78
Ash	
Hemlock	74
Hickory	80
Hophorn	78
beam	

Larch	78
Northern Red Oak	79
Norway Spruce	78
Other Hardwood	78
Other Softwood	78
Pin Cherry	78
Pitch Pine	78
Red Maple	80
Red Pine	80
Red Spruce	80
Sassafras	78
Scotch Pine	78
Serviceb erry	78
Striped Maple	78
Sugar Maple	82
White Ash	80
White Oak	78
White Pine	80

White	78
Spruce	
Witch	78
Hazel	
	80
Yellow	
Poplar	

ADD the following species and respective form classes:

Table Mountain Pine	70	
Virginia Pine		70
Eastern Red Cedar	70	
Apple		70
Scarlet Oak		78
Sycamore		78
Silver Maple		78
Ailanthus		78

DATA COLLECTION SUMMARY FOR POCKET DOG ON PDA'S

Job File Name: Tract_Name_Compartment_Cruisers_Initials_Date

Product Code (PROD): AGS Sawtimber A1

UGS Sawtimber U1

SSUGS Sawtimber S1 ????

*Paul – are Seed Source UGS

really necessary? Or do we want to classify

Veneer Sawtimber V1 those as just UGS?


AGS Pulpwood A2

UGS Pulpwood U2

SSUGS Pulpwood S2

Regeneration RG

Cull U3

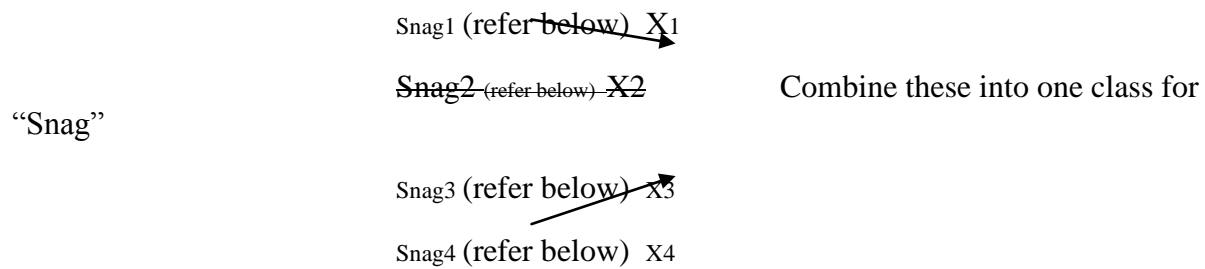
UGS Cull  U9

tree must be 10+ inches)

Combine these into “Den Tree” (Den

SSUGS Cull S9

Non-Commercial NC



Growing Stock: For all live Sawtimber and Pulpwood trees tallied, assign them a Growing Stock value of Acceptable Growing Stock (**AGS**),

Unacceptable Growing Stock (**UGS**), or Seed Source Unacceptable Growing Stock (**SSUGS**) based on the following criteria:

AGS = desirable species that contain at least one grade 3 log or will in the future, likely to persist another 15 years.

UGS = trees that do not contain at least one grade 3 or better log and never will, or are not likely to persist another 15 years.

SSUGS = trees that could be retained as a desirable seed source, yet otherwise meet the definition of UGS.

Other Stock: **Cull** = live sawtimber or pole-sized trees that do not contain a merchantable product due to poor form, quality, or undesirable

species. Note – if 50% or more of a stem’s volume is non-merchantable, define it as “Cull”.

UGS Cull = a sawtimber sized standard Cull tree as defined above, but with a wildlife cavity within the stem

SSUGS Cull = a sawtimber sized standard Cull tree as defined above, but with seed source value and a wildlife cavity within the stem.

Non-Commercial = live pole-sized stems less than 5.0” dbh

Snag1 = Tree with branches and twigs that resembles a live tree (except for leaves)

Snag2 = Tree with no twigs but with persistent small and large branches
ONE SNAG CATEGORY

Snag3 = Tree with large branches only

Snag4 = Bole only, no branches

CWD1 = sound lying dead wood, with diameters $\approx 5.0''$

CWD2 = intermediate lying dead wood, with diameters $\approx 5.0''$

CWD3 = rotten dead wood, with diameters $\approx 5.0''$

DBH: Diameter Breast Height by two-inch diameter classes.

Height (MHT): For all Sawtimber and Pulpwood trees record the number of 16-foot logs to the nearest $\frac{1}{2}$ log. Record $\frac{1}{2}$ logs as a 5 (i.e. $2\frac{1}{2}$ log tree = 25).

Defect (DFC): Recorded as a percentage of the defect within the tree by increments of 5% (i.e. a tree with 30% defect is recorded as 30, a tree with 5% defect is recorded as a 5).

No % defect will be used. Reduce height accordingly when tallying.

Seedling Regeneration: Within a 3.72 foot radius plot (mil-acre) count all seedlings between 2" and 12" tall as one stem each. All seedlings over 12" tall should be counted as two stems each. All individual oak seedlings $\geq 3'$ tall shall receive a weighted count of 20. All individual oak seedlings $\geq 5'$ tall should receive a weighted count of 50. If you have more than 50 seedlings per species, record 50+. In the case of stump sprouts, only count 3 stems from each stump (relates to self-thinning) If within the mil-acre plot there are no seedlings present pertaining to the listed species, record

Not Stocked within each of the seedling regeneration boxes.

Invasive Species: Within the Text Data section of the inventory, document the presence of any and all non-native invasive species within and between plots. Reference Invasive Species listed on “Working Woodlands Inventory Cheat Sheet”

Comments: List any general notes or information pertinent to the plot or stand conditions including forest health, regeneration, competing vegetation, harvesting, unproductive/non-forest areas, site limitations, etc.

Wildlife Habitat Inventory

The purpose of this inventory is to develop a mapping and reporting system for several significant wildlife habitat components found to be on the ownership and to allow these components to be managed appropriately in conjunction with other forest management practices. The habitat components are represented in two ways for each of the tracts within the ownership. The first is a tract level summary report of the habitat components that are inventoried. The second is a series of stand level maps, each representing a combination of the various habitat features.

1. Low Woody Cover (2-10' Zone): Visually group foliage of shrubs (e.g., mountain laurel) and undesirable trees (e.g., striped maple) within the two (2) to ten (10) foot zone above the ground and in direct competition or inhibiting desirable regeneration. Estimate cover by 5% increments within the 1/5th acre sample plot.
2. Low Woody Interference (primary species): Record the primary species of interference from the drop down list. If no competing woody vegetation is present leave this field blank.
3. Fern Cover (0-2' Zone): Estimate percent cover by 5% increment. For other fern species, report their coverage as one half.
4. Fern Cover Identification (primary species): Record the dominating fern species from the drop down list. If no fern is present, leave this field blank.
5. Grass and Sedge: Estimate percent cover by 5% increments. Record <5% even if only a trace of grass or sedge is present.
6. Grapevine: Record the number of grapevines rooted in the 1/5th acre plot (52.7' radius).

7. Deer Impact Level: Assessed within plots and between plots. One value assigned per plot. Refer to Table

- 1.) No Impact – found only inside well-maintained woven-wire deer-exclosure fences
- 2.) Low Impact – desirable regeneration abundant and of varying heights.
Herbaceous plants common. Stump sprouts present.
- 3.) Moderate Impact – desirable regeneration present but with little height variability.
Herbaceous plants rare. No stump sprouts. Non-preferred browse and browse-resilient plant species are noticeably common and widespread.
- 4.) High Impact – desirable regeneration rare to absent. Non-preferred and browse-resilient vegetation limited in height growth by deer browsing.
- 5.) Very High Impact – desirable regeneration absent. Abundance of non-preferred vegetation is also reduced by browsing, browse-resilient plants show signs of heavy repeated browsing and a browse line is readily evident.

8. Special Note: Document other observations relevant to forest management

9. Course Woody Debris data will be collected independently on a separate paper tally using the line intersect methodology (Harmon & Sexton, 1996). Two 50 meter transects are established bisecting each plot center oriented in cardinal directions (N-S, E-W). The diameters of lying dead wood (≥ 10 cm) intersecting the lines are measured and tallied. Each stem tallied will be assigned to one of three density classes (sound, intermediate, and rotten) determined by using the “machete test”, as recommended by IPCC Good Practice Guidance for LULUCF (2003), Section 4.3.3.5.3.

Eliminate this evaluation of CWD. Change to CWD “present” or “absent”. Must be 10’ long and 10” diameter at small end to be classified as CWD. Have drop-down menu with 0-20 to put number of CWD tallied. CWD within 1/20 acre plot.

TABLE A

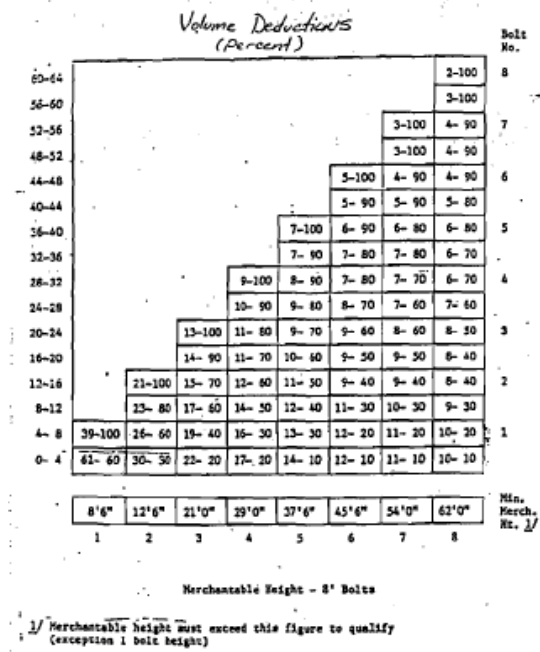
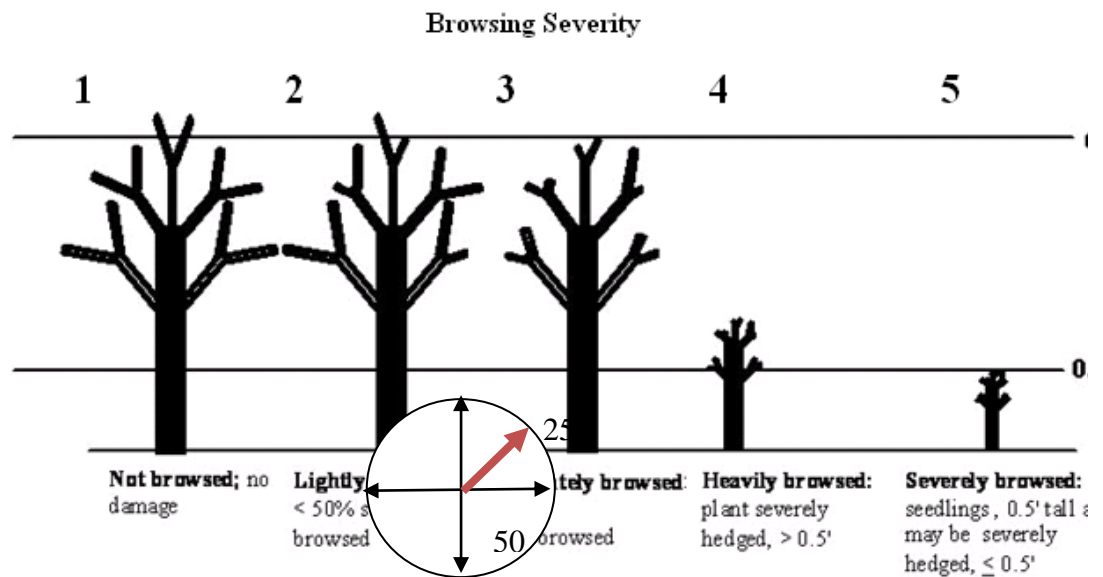


FIGURE A



Appendix H : Rare, Threatened and Endangered Species Information

From PA Natural Heritage Program

Plant Status Codes and Definitions

E	Pennsylvania Endangered - Plant species which are in danger of extinction throughout most of their natural range within this Commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that have been classified as Pennsylvania Extirpated, but which subsequently are found to exist in this Commonwealth.								
T	Pennsylvania Threatened - Plant species which may become endangered throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained to prevent their future decline, or if the species is greatly exploited by man.								
R	Pennsylvania Rare - Plant species which are uncommon within this Commonwealth. All species of the native wild plants classified as Disjunct, Endemic, Limit of Range and Restricted are included within the Pennsylvania Rare classification.								
	<table> <tr> <td>Disjunct</td><td>Significantly separated from their main area of distribution</td></tr> <tr> <td>Endemic</td><td>Confined to a specialized habitat.</td></tr> <tr> <td>Limit of Range</td><td>At or near the periphery of their natural distribution</td></tr> <tr> <td>Restricted</td><td>Found in specialized habitats or habitats infrequent in Pennsylvania.</td></tr> </table>	Disjunct	Significantly separated from their main area of distribution	Endemic	Confined to a specialized habitat.	Limit of Range	At or near the periphery of their natural distribution	Restricted	Found in specialized habitats or habitats infrequent in Pennsylvania.
Disjunct	Significantly separated from their main area of distribution								
Endemic	Confined to a specialized habitat.								
Limit of Range	At or near the periphery of their natural distribution								
Restricted	Found in specialized habitats or habitats infrequent in Pennsylvania.								
X	Pennsylvania Extirpated - Plant species believed by the Department to be extinct within this Commonwealth. These plants may or may not be in existence outside the Commonwealth.								
V	Pennsylvania Vulnerable - Plant species which are in danger of population decline within Commonwealth because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.								
U	Tentatively Undetermined - A classification of plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification due to taxonomic uncertainties, limited evidence within historical records, or insufficient data. No current legal status exists, but is under review for future listing.								

Native Plant Species Legislative Authority: Title 17 Chapter 45, Conservation of Native Wild Plants, January 1, 1988; Pennsylvania Department of Conservation and Natural Resources.

Wild Birds and Mammals Status Codes and Definitions

E	Pennsylvania Endangered - Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate. These are: 1) species whose numbers have already been reduced to a critically low level or whose habitat has been so drastically reduced or degraded that immediate action is required to prevent their extirpation from the Commonwealth; or 2) species whose extreme rarity or peripherality places them in potential danger of precipitous declines or sudden extirpation throughout their range in Pennsylvania; or 3) species that have been classified as "Pennsylvania Extirpated", but which are subsequently found to exist in Pennsylvania as long as the above conditions 1 or 2 are met; or 4) species determined to be "Endangered" pursuant to the Endangered Species Act of 1973, Public Law 93 205 (87 Stat. 884), as amended.
T	Pennsylvania Threatened - Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated. These are: 1) species whose populations within the Commonwealth are decreasing or have been heavily depleted by adverse factors and while not actually endangered, are still in critical condition; 2) species whose populations may be relatively abundant in the Commonwealth but are under severe threat from serious adverse factors that have been identified and documented; or 3) species whose populations are rare or peripheral and in possible danger of severe decline throughout their range in Pennsylvania; or 4) species determined to be "Threatened" pursuant to the Endangered Species Act of 1973, Public Law 93205 (87 Stat. 884), as amended, that are not listed as "Pennsylvania Endangered".

Wild Birds and Mammals Legislative Authority: Title 34 Chapter 133, Game and Wildlife Code, revised Dec. 1, 1990, Pennsylvania Game Commission.

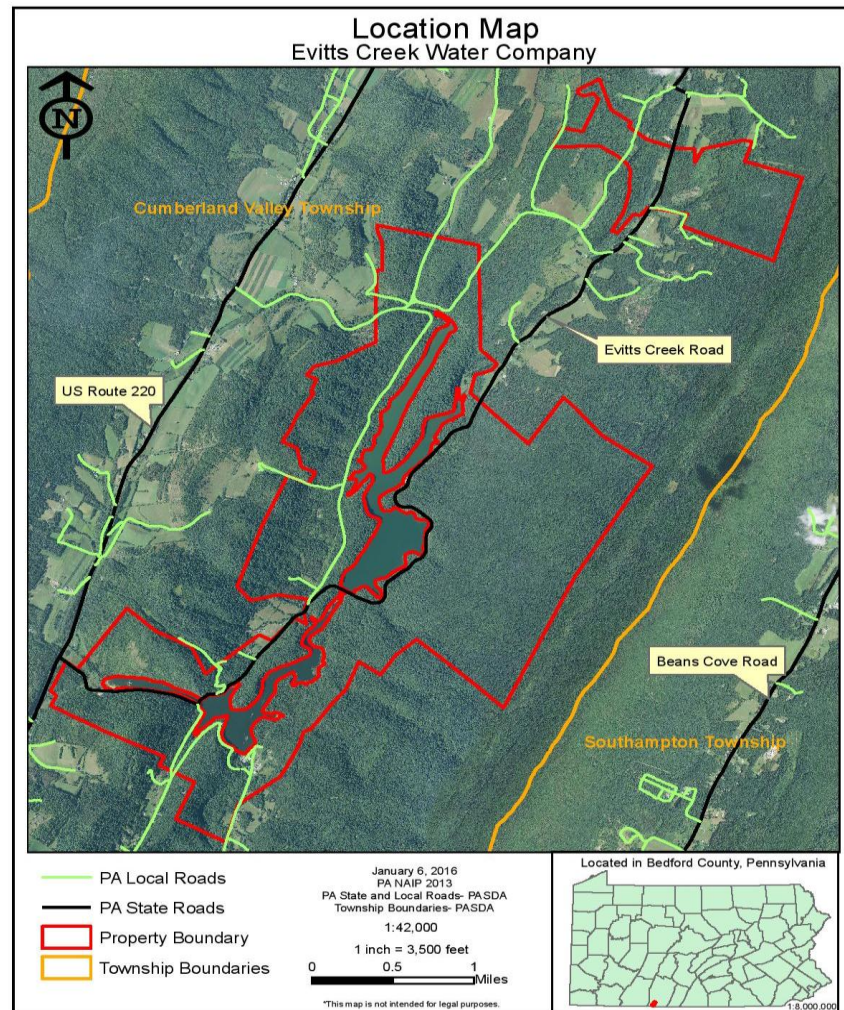
State Rank Codes and Definitions

1	Critically Imperiled - Critically imperiled in the nation or state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.
2	Imperiled - Imperiled in the nation or state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state.
3	Vulnerable - Vulnerable in the nation or state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
4	Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
5	Secure - Common, widespread, and abundant in the nation or state.
#S#	Range Rank - A numeric range rank (e.g., S2S3 or S1S3) is used to indicate any range of uncertainty about the status of the species or ecosystem.
NR	Not Ranked - State conservation status not yet assessed.
	Unknown - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

U	
X	Presumed Extinct - Species or community is believed to be extirpated from the nation or state. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
H	Possibly Extinct (Historical) - Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
NA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
NatureServe Ranks	

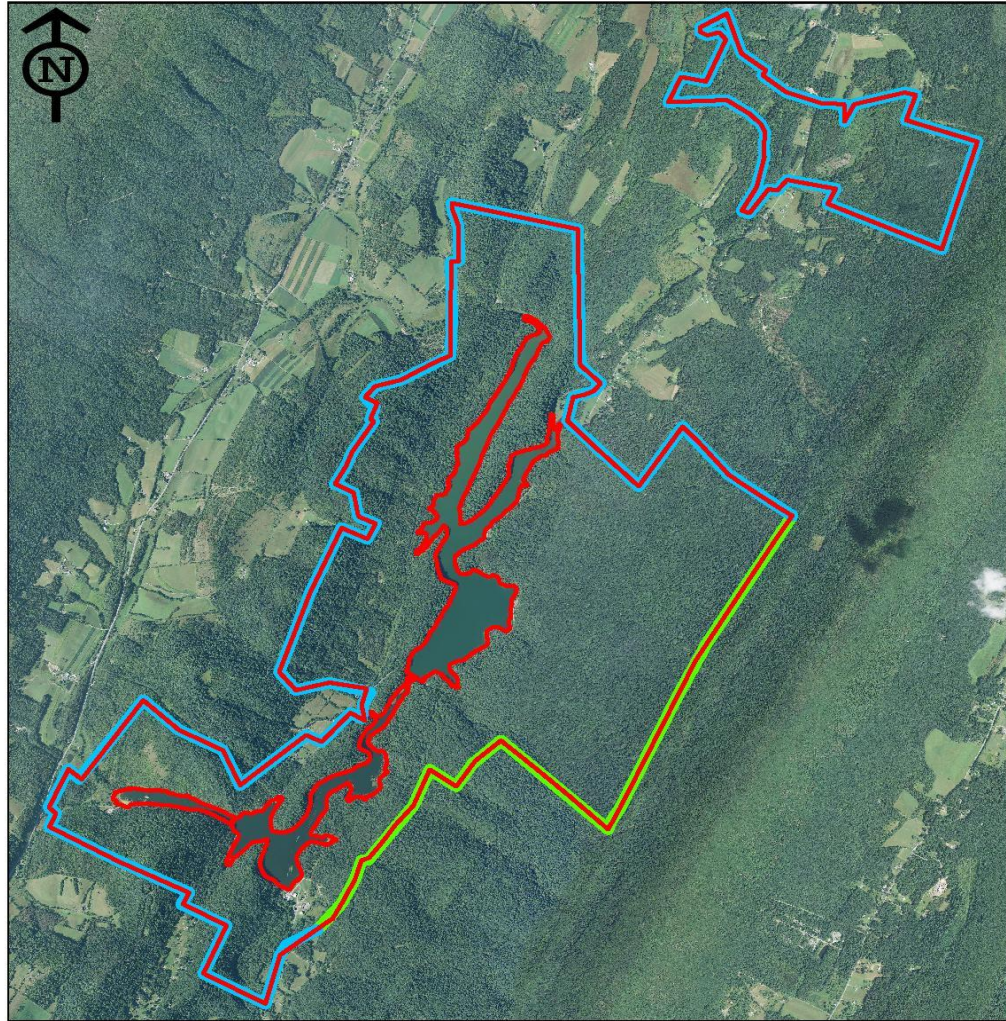
Appendix I: Maps

Map 1: Location Map. Evitts Creek Water Company Lands, Cumberland Valley Township, PA



Adjacent Ownership Map

Evitts Creek Water Company

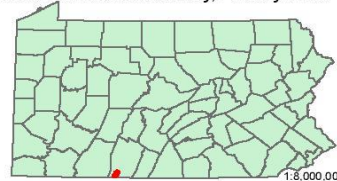


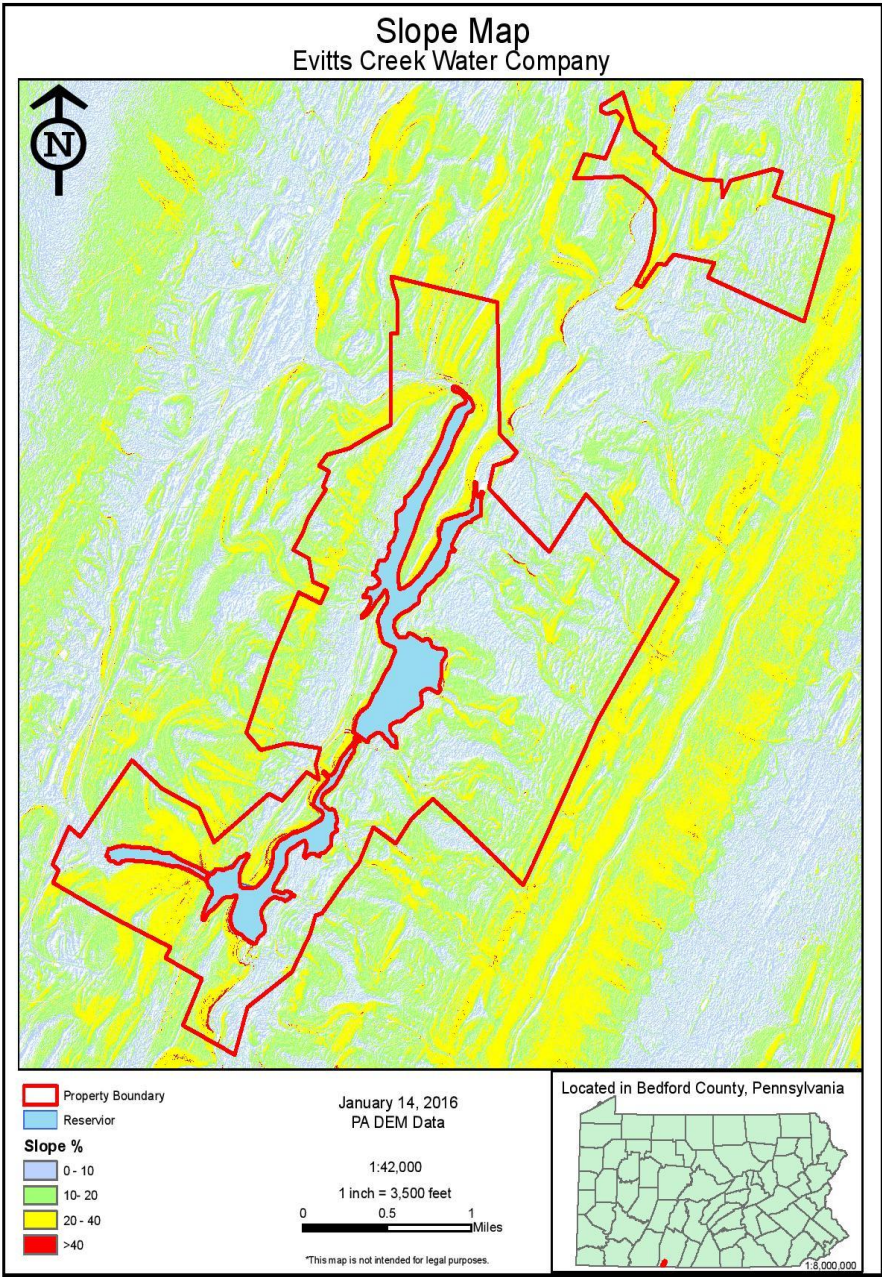
- Property Boundary
- Private Land
- Public Land

January 20, 2016
PA DEM Data
Bedford County PA Tax Parcel Data
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1 inch = 3,500 feet
0 0.5 1 Miles

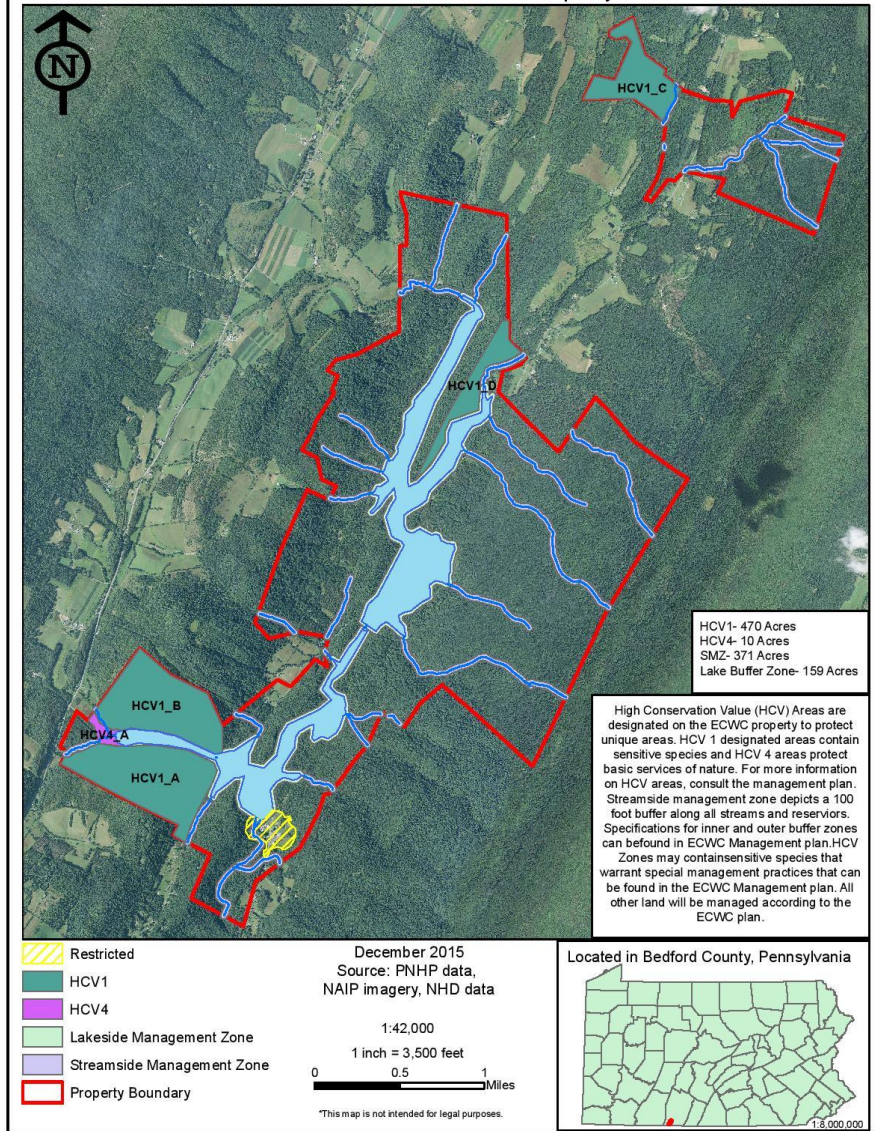
*This map is not intended for legal purposes.

Located in Bedford County, Pennsylvania

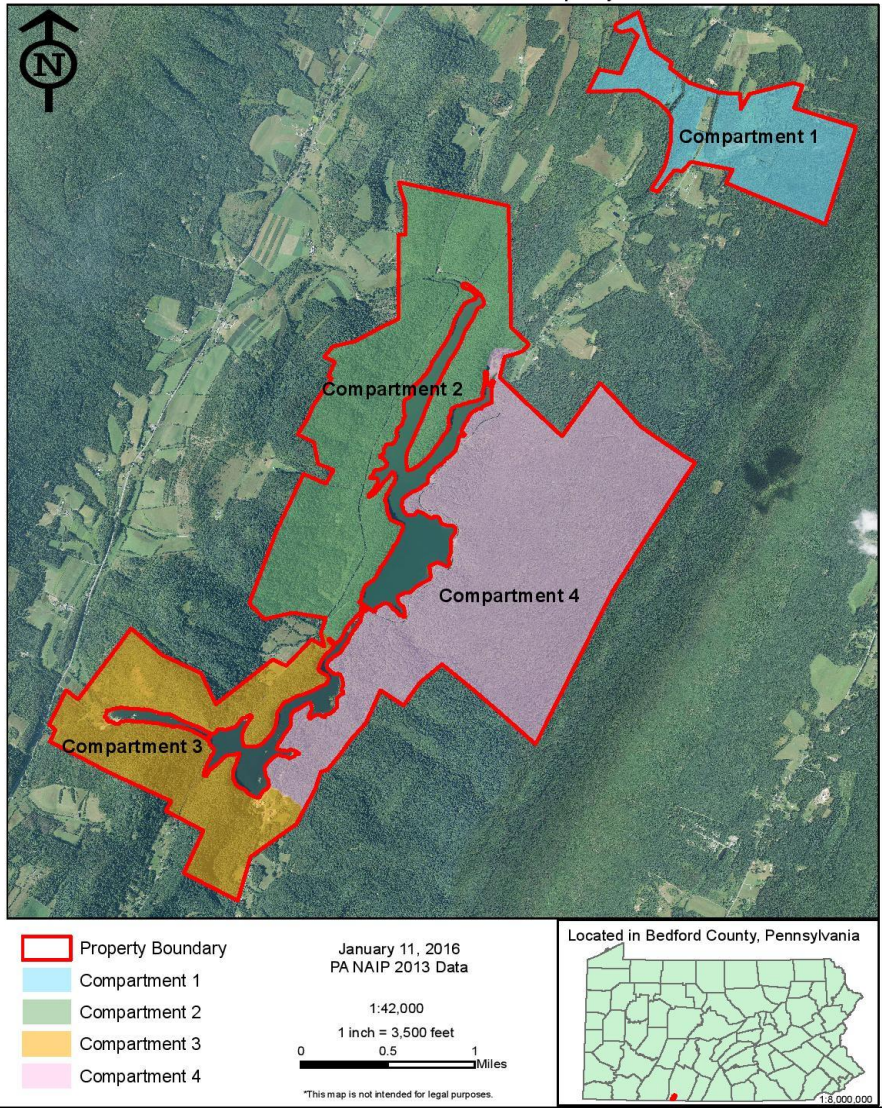




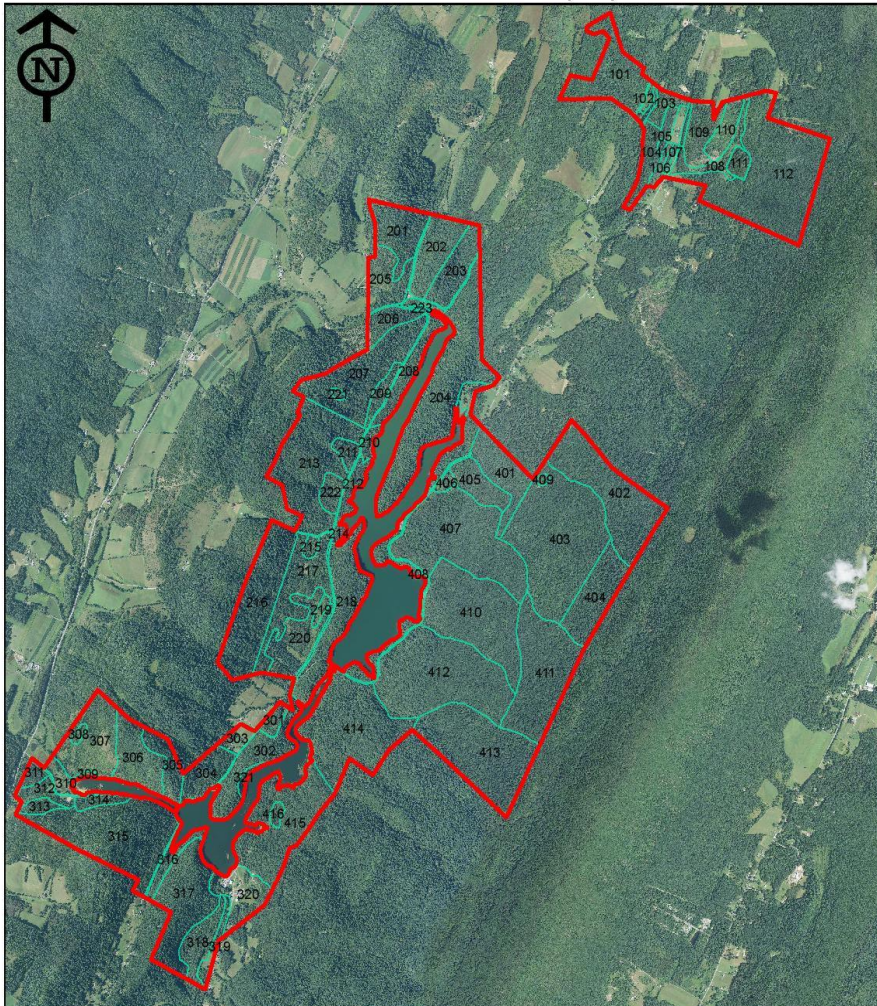
Management Areas Map Evitts Creek Water Company



Compartment Map
Evitts Creek Water Company



Stand Map Evitts Creek Water Company



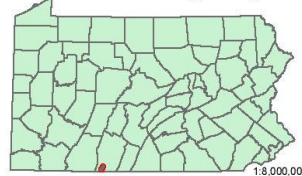
- Property Boundary
- Stands

January 11, 2016
PA NAIP 2013 Data

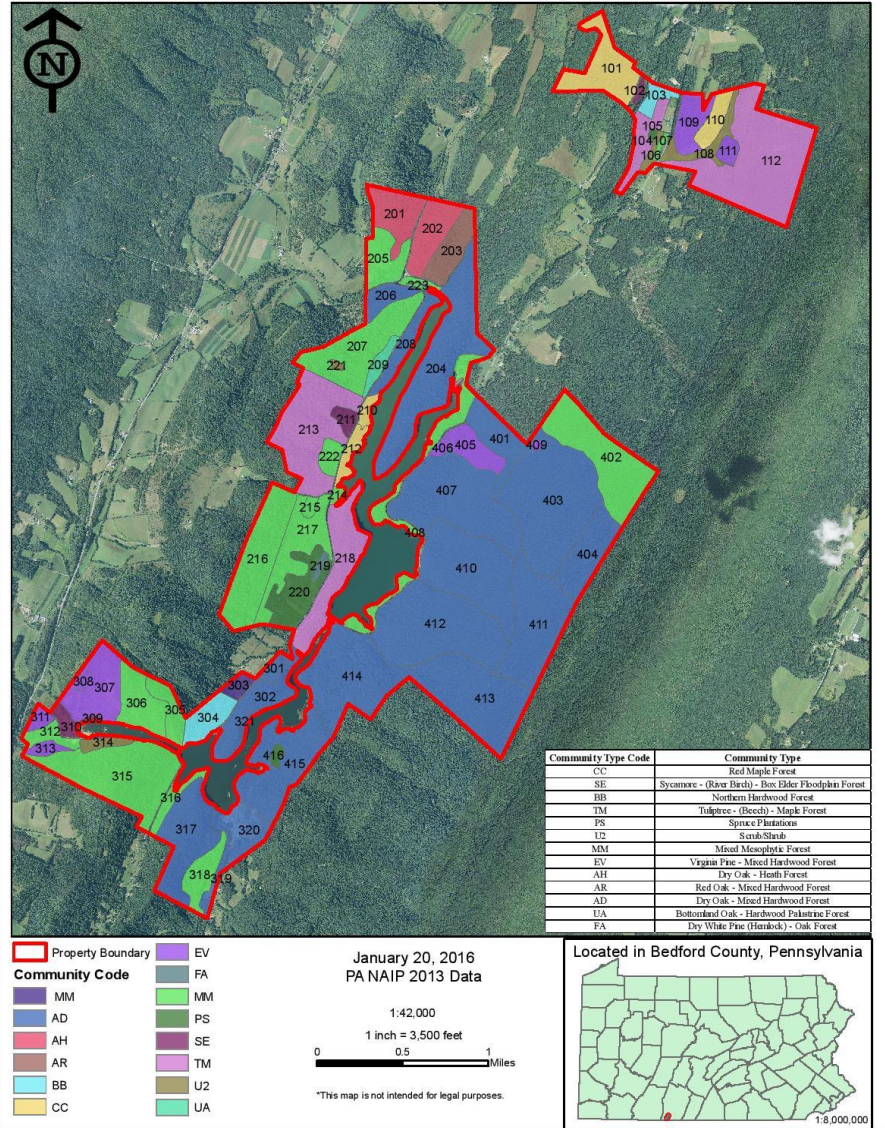
1:42,000
1 inch = 3,500 feet
0 0.5 1 Miles

*This map is not intended for legal purposes.

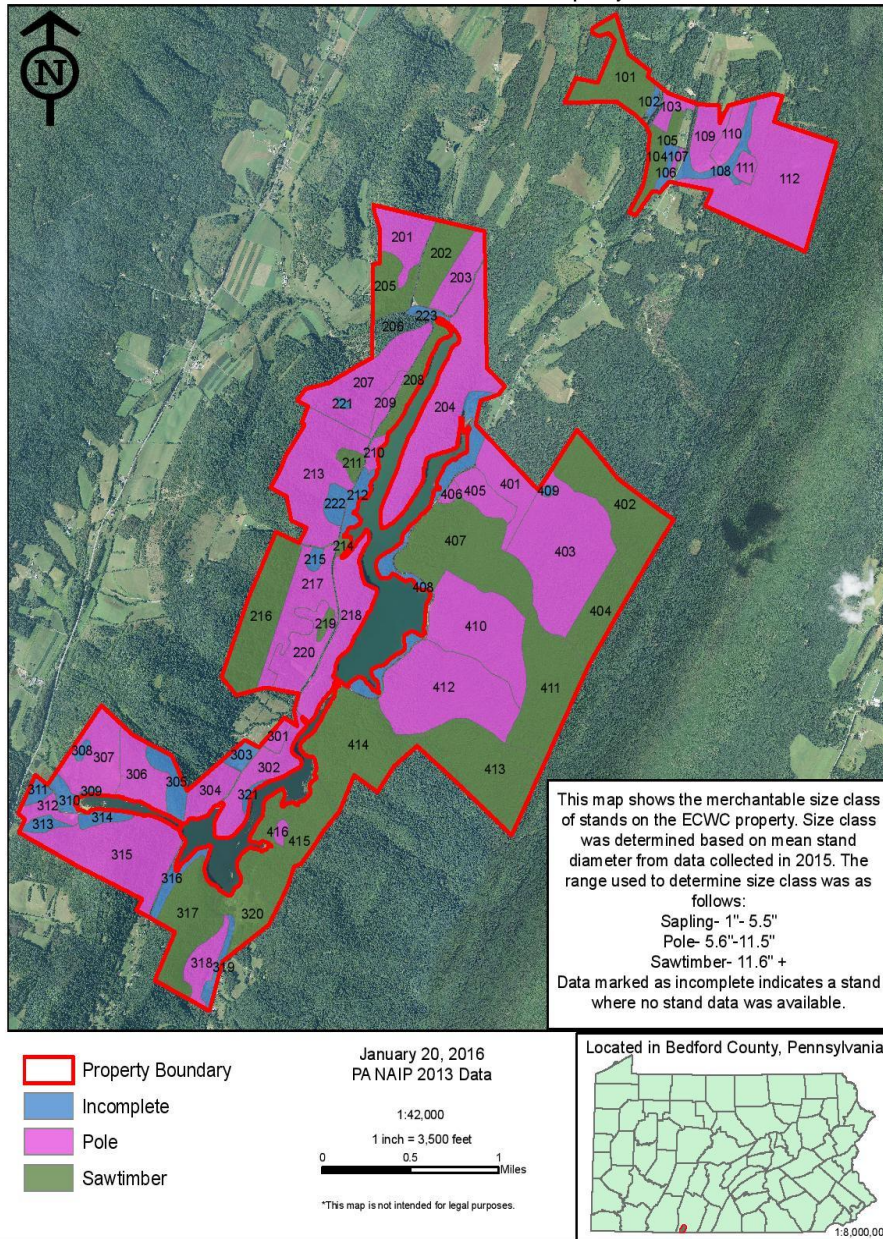
Located in Bedford County, Pennsylvania



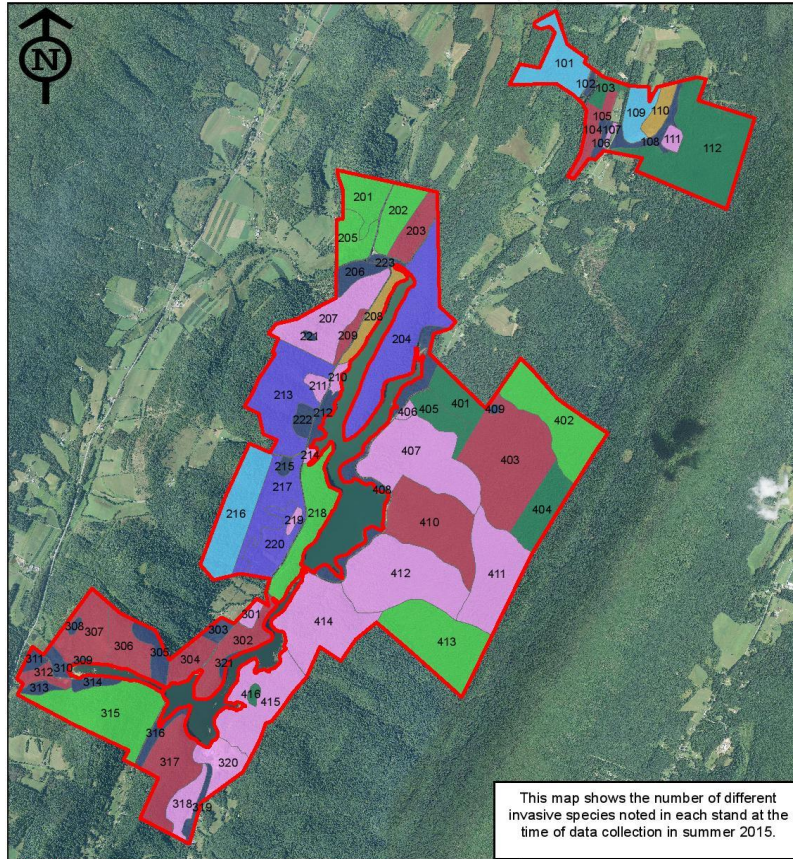
Stands by Community Type Map Evitts Creek Water Company



Stands by Size Class Map Evitts Creek Water Company



Invasive Species Abundance Map Evitts Creek Water Company



January 26, 2016
PA NAIP 2013 Data

1:42,000
1 inch = 3,500 feet
0 0.5 1 Miles

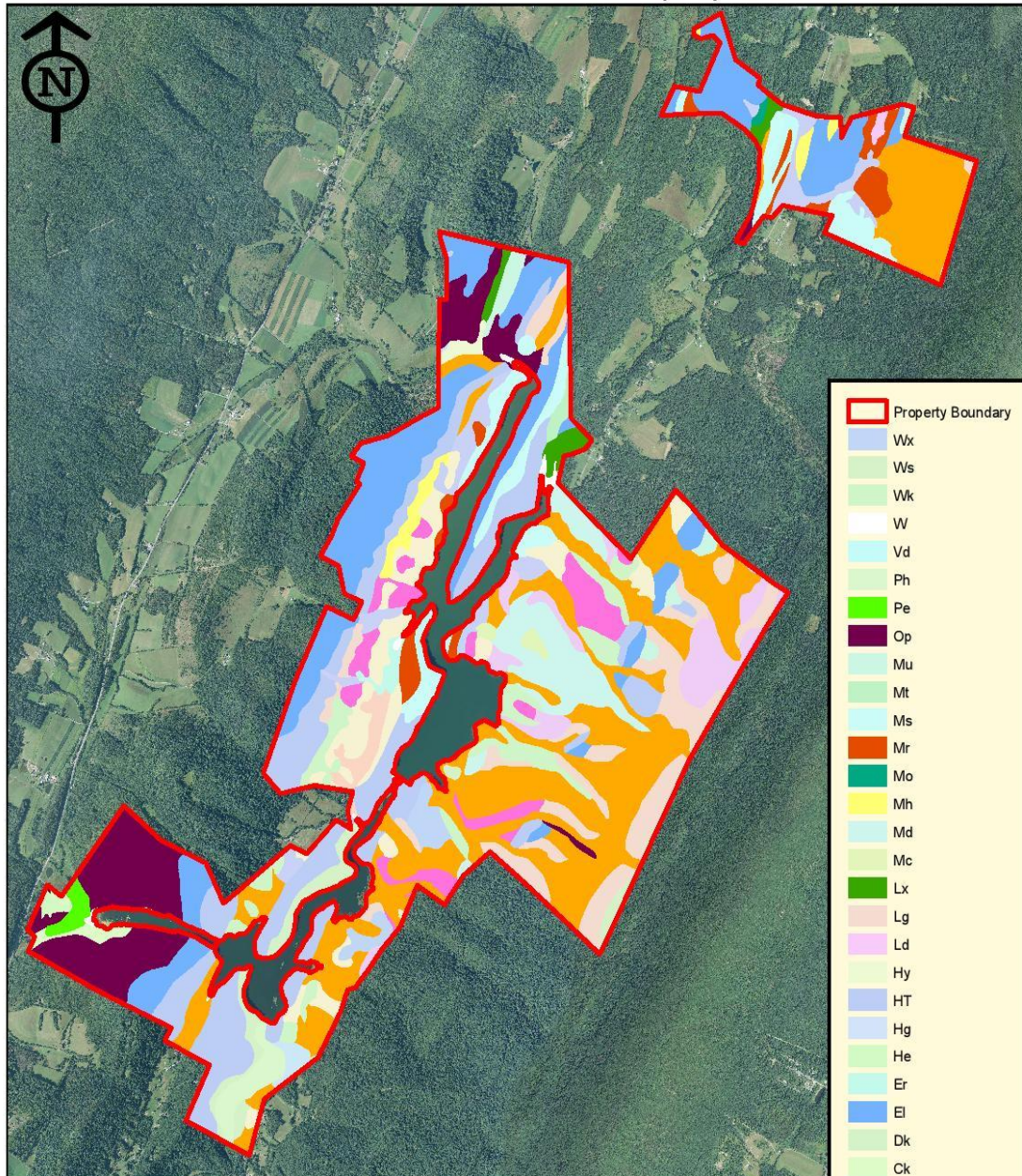
*This map is not intended for legal purposes.

Located in Bedford County, Pennsylvania



Soils Map

Evitts Creek Water Company



- Property Boundary
- Wx
- Ws
- Wk
- W
- Vd
- Ph
- Pe
- Op
- Mu
- Mt
- Ms
- Mr
- Mo
- Mh
- Md
- Mc
- Lx
- Lg
- Ld
- Hy
- HT
- Hg
- He
- Er
- Ei
- Dk
- Ck
- Bw
- Bu
- Bt
- Br
- Bk
- Bd
- Ar
- Ab

Located in Bedford County, Pennsylvania



1:8,000,000

January 11, 2016
PA NAIP 2013
NRCS Web Soil Survey

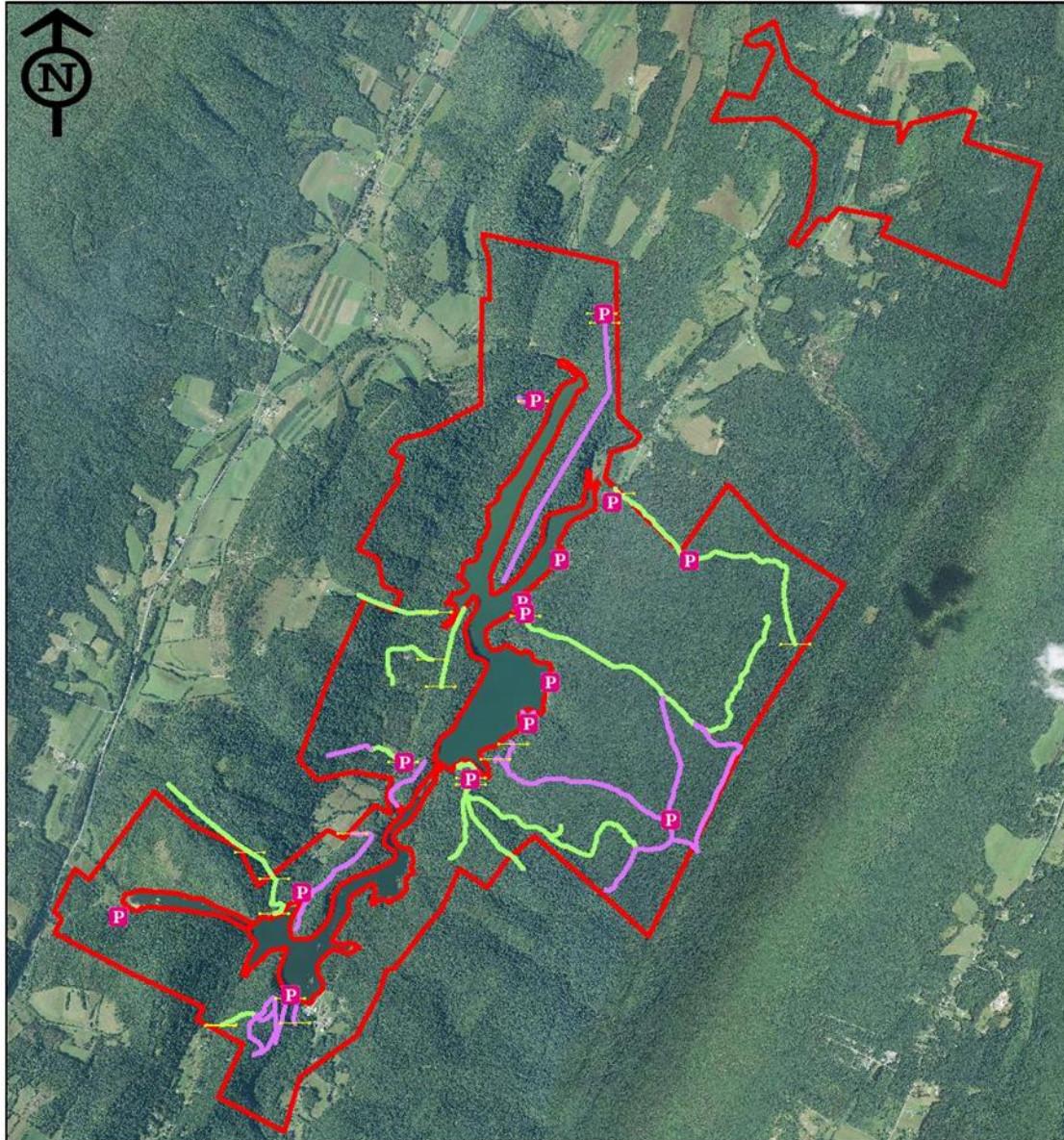
1:42,000

1 inch = 3,500 feet

0 0.5 1 Miles

*This map is not intended for legal purposes.

Interior Access Map Evitts Creek Water Company



- P Parking Area
- Gates
- Trails
- Roads
- Property Boundary

January 21, 2016
PA NAIP 2013 Imagery
GPS Data- ACM Forestry 2014

1:42,000
1 inch = 3,500 feet
0 0.5 1 Miles

*This map is not intended for legal purposes.

Located in Bedford County, Pennsylvania



Appendix J: Stand Tables

Stand Summary Table (All Compartments)

Page 1

Stand #	Stand Size (Acres)	Forest Community Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Index	Sawtimber Volume (Bd.Ft/Ac.)	Pulpwood Volume (Tons)	# Invasive Species
101	70.8	Red Maple Forest	Sawtimber	Very Good	68%	32%	73	9,930	12	5
102	4	Sycamore - (River Birch) -	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
103	13.7	Northern Hardwood	Pole	Very Good	96%	4%	N/A	12,017	23	1
104	30.5	Tuliptree - (Beech) -	Sawtimber	Very Good	97%	3%	N/A	18,201	8	3
105	1.8	Spruce Plantations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
106	6.8	Scrub/Shrub	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
107	3.3	Mixed Mesophytic	Pole	Very Good	88%	12%	N/A	15,453	24	2
108	22.8	Scrub/Shrub	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
109	33.8	Virginia Pine - Mixed	Pole	Very Good	74%	26%	N/A	4,361	30	5
110	22	Red Maple Forest	Pole	Very Good	75%	25%	N/A	3,928	25	0
111	10.3	Virginia Pine - Mixed	Pole	Fair	86%	14%	73	None	35	2
112	199.4	Tuliptree - (Beech) -	Pole	Good	78%	22%	N/A	9,820	24	1

Stand Summary Table (All Compartments)
Page 2

Stand #	Stand Size (Acres)	Forest Community Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Index	Sawtimber Volume (Bd.Ft/Ac.)	Pulpwood Volume (Tons)	# Invasive Species
201	48.3	Dry Oak - Heath Forest	Pole	Very Good	81%	19%	65	9,724	17	4
202	47.2	Dry Oak - Heath Forest	Sawtimber	Very Good	88%	12%	N/A	14,094	9	4
203	39.5	Red Oak - Mixed	Pole	Very Good	83%	17%	74	10,430	8	3
204	164.9	Dry Oak - Mixed	Pole	Very Good	84%	16%	111	12,737	13	6
205	39.3	Mixed Mesophytic	Sawtimber	Poor	77%	23%	56	3,521	4	4
206	21.7	Dry Oak - Mixed	N/A	Very Good	93%	7%	N/A	N/A	N/A	N/A
207	97.6	Mixed Mesophytic	Pole	Very Good	82%	18%	N/A	11,462	13	2
208	33.1	Dry Oak - Mixed	Sawtimber	Very Good	93%	7%	N/A	14,919	12	0
209	13.5	Bottomland Oak -	Pole	Fair	44%	56%	N/A	None	9	3
210	8.7	Red Maple Forest	Pole	Poor	73%	27%	N/A	2,402	14	2
211	10.8	Sycamore - (River Birch) -	Sawtimber	Very Good	47%	53%	N/A	6,476	9	2
212	17.3	Red Maple Forest	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Stand #	Stand Size (Acres)	Forest Community Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Index	Sawtimber Volume (Bd.Ft/Ac.)	Pulpwood Volume (Tons)	# Invasive Species
201	48.3	Dry Oak - Heath Forest	Pole	Very Good	81%	19%	65	9,724	17	4
202	47.2	Dry Oak - Heath Forest	Sawtimber	Very Good	88%	12%	N/A	14,094	9	4
203	39.5	Red Oak - Mixed	Pole	Very Good	83%	17%	74	10,430	8	3
204	164.9	Dry Oak - Mixed	Pole	Very Good	84%	16%	111	12,737	13	6
205	39.3	Mixed Mesophytic	Sawtimber	Poor	77%	23%	56	3,521	4	4
206	21.7	Dry Oak - Mixed	N/A	Very Good	93%	7%	N/A	N/A	N/A	N/A
207	97.6	Mixed Mesophytic	Pole	Very Good	82%	18%	N/A	11,462	13	2
208	33.1	Dry Oak - Mixed	Sawtimber	Very Good	93%	7%	N/A	14,919	12	0
209	13.5	Bottomland Oak -	Pole	Fair	44%	56%	N/A	None	9	3
210	8.7	Red Maple Forest	Pole	Poor	73%	27%	N/A	2,402	14	2
211	10.8	Sycamore - (River Birch) -	Sawtimber	Very Good	47%	53%	N/A	6,476	9	2
212	17.3	Red Maple Forest	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Stand Summary Table (All Compartments)

Page 3

Stand #	Stand Size (Acres)	Forest Community Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Index	Sawtimber Volume (Bd.Ft/Ac.)	Pulpwood Volume (Tons)	# Invasive Species
213	125.7	Tuliptree - (Beech) - Maple	Pole	Very Good	84%	16%	87	10,457	20	6
214	4.1	Mixed Mesophytic	Sawtimber	Good	92%	8%	N/A	11,192	9	2
215	5.5	Mixed Mesophytic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
216	104.2	Mixed Mesophytic	Sawtimber	Very Good	83%	17%	N/A	18,444	12	5
217	68.2	Mixed Mesophytic	Pole	Very Good	67%	33%	112	5,937	33	6
218	84	Tuliptree - (Beech) - Maple	Pole	Very Good	79%	21%	N/A	16,650	14	4
219	5.3	Dry White Pine (Hemlock) - Oak	Sawtimber	Good	92%	8%	N/A	10,262	11	2
220	53.5	Spruce Plantations	Pole	Very Good	73%	27%	50	1,622	30	6
221	2.3	Scrub/Shrub	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
222	14.3	Mixed Mesophytic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
223	5.9	Mixed Mesophytic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
301	9.2	Dry Oak - Mixed Hardwood	Pole	Very Good	25%	75%	N/A	5,480	49	2

Stand Summary Table (All Compartments)

Page 4

[illegible]

Stand Summary Table (All Compartments)

Page 5

Stand #	Stand Size (Acres)	Forest Community Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Index	Sawtimber Volume (Bd.Ft/Ac.)	Pulpwood Volume (Tons)	# Invasive Species
314	10.7	Scrub/Shrub	N/A	Very Good	88%	12%	85	N/A	N/A	N/A
315	142.8	Mixed Mesophytic	Pole	Very Good	64%	36%	70	8,834	22	4
316	16.2	Mixed Mesophytic	N/A	N/A	N/A	N/A	90	N/A	N/A	N/A
317	91.2	Dry Oak - Mixed	Sawtimber	Very Good	64%	36%	75	10,578	15	3
318	31.8	Mixed Mesophytic	Pole	Good	72%	28%	N/A	4,261	18	2
319	13	Dry Oak - Mixed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
320	43.7	Dry Oak - Mixed	Sawtimber	Very Good	91%	9%	N/A	12,764	31	2
321	5.3	Dry Oak - Mixed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
401	49.2	Dry Oak - Mixed	Pole	Very Good	82%	18%	N/A	14,353	14	1
402	118.8	Mixed Mesophytic	Sawtimber	Very Good	82%	18%	85	14,107	11	4
403	196.6	Dry Oak - Mixed	Pole	Very Good	76%	24%	85	9,121	20	3
404	61.3	Dry Oak - Mixed	Sawtimber	Very Good	92%	8%	73	9,891	12	1

Stand Summary Table (All Compartments)

Page 6

Stand #	Stand Size (Acres)	Forest Community Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Index	Sawtimber Volume (Bd.Ft/Ac.)	Pulpwood Volume (Tons)	# Invasive Species
405	31.3	Virginia Pine - Mixed	Pole	Very Good	80%	20%	N/A	8,552	29	1
406	5	Virginia Pine - Mixed	Pole	Fair	82%	18%	88	1,533	14	2
407	160.6	Dry Oak - Mixed	Sawtimber	Very Good	82%	18%	88	12,736	14	2
408	64.3	Mixed Mesophytic	N/A	N/A	N/A	N/A	73	N/A	N/A	N/A
409	2.1	Virginia Pine - Mixed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
410	138.7	Dry Oak - Mixed	Pole	Very Good	82%	18%	75	10,417	16	3
411	121.8	Dry Oak - Mixed	Sawtimber	Very Good	85%	15%	N/A	13,236	9	2
412	174	Dry Oak - Mixed	Pole	Very Good	74%	26%	78	10,643	13	2
413	139	Dry Oak - Mixed	Sawtimber	Very Good	89%	11%	78	11,635	12	4
414	141.3	Dry Oak - Mixed	Sawtimber	Very Good	86%	14%	77	9,316	9	2
415	113.4	Dry Oak - Mixed	Sawtimber	Very Good	83%	17%	80	12,618	17	2
416	5	Spruce Plantations	Pole	Very Good	75%	25%	N/A	9,290	23	1

Additions to Forest Management Plan Evitts Creek Water Company

May 10, 2017

Prescriptions by Michael T. Wolf, Appalachian Forest Consultants, 3951 Lincoln Highway, Stoystown, PA 15563

Priority Management Units:

216, 402, 415, 403, 410, 411, 414

Time Frame of Upcoming Projects Related to Priority Management Units:

2018-2024

Silvicultural Prescriptions for Each Priority Management Unit:

216:

Description 216:

(From Silvah Report) Stand 216 is a 107.4 acre mixed upland forest. This Allegheny hardwood stand is dominated by Yellow-poplar, Sugar Maple, Red Maple, Non Comm. Species, Red Oak, Hickory, Black Birch, Misc Comm. Species and Black Oak which together comprise 89 percent of the basal area. This is a large sawtimber stand, with average medial diameter of 18.1 inches. Total growing stock amounts to 108 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 26.6 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 14.5 cords of pulp wood and 7384.0 board feet of sawtimber (Scribner log rule). Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Non-commercial saplings and poles represent 6 sq. ft. of basal area and may need to be treated prior to final harvest cutting. Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand. Undesirable understory plants will interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense fern cover and dense grass cover.

Silvicultural Prescription 216:

(From Silvah Report) SILVAH has recommended a Herbicide, fence. A Shelterwood sequence, which would normally be recommended here, may not work because relative density is already low and competitive regeneration is lacking; further reductions in density probably won't help. A combination of high deer density and low seed production will probably make it difficult to get adequate competitive regeneration established.

Protect the stand from deer browsing with a fence. Overstory density is low enough and seed supply sufficient for competitive regeneration to become established within 3 - 10 years. Fencing is recommended to protect seedlings from deer.

Warnings

- The merchantable medial diameter (19.0) is just above the 18 inch decision point in Chart A; the stand may not be mature.

Additional treatments

- Treat the undesirable understory plants with an application of herbicide during the appropriate part of the growing season. Herbicide is an effective, safe and economical technique for removing vegetation that interferes with establishment and growth of oak regeneration. There are five different application techniques for using herbicides to control interfering vegetation. Each is matched with a specific set of conditions where it will provide effective control. With all, be sure to follow all instructions on the herbicide label, wear appropriate safety clothing and equipment, and follow applicable laws with regard to herbicide applicator licensing. Please refer to the silvicultural guide for details about implementing this prescription.
- Current deer levels will likely prevent regeneration developing into a new stand. Fencing is recommended to protect seedlings from deer. A fence can be constructed either before or after treatment. If fencing is constructed after treatment, fencing should be done as soon as possible.
- This stand has 73.7 percent of the understory plots stocked with grapevines. Grapevines that grow into the crowns of trees can cause extensive damage by interfering with growth and seed production, and by breaking out the tops of the trees. Damage can be especially severe in young, even-aged stands. In stands with more than 30 percent of the understory plots stocked with grapevines, it is usually advisable to treat the vines. This can be done by cutting the vines close to the ground. Canopy shade will usually prevent the sprouts from surviving. Where canopy density is low, or where harvest cutting will occur within a few years, cut the vines and treat the cut stumps with an herbicide.

These prescriptions generally produce the desired results, requires an investment, and usually will yield an economic return at the same time. If such investment meets your organization's economic criteria, we recommend it. If not, we recommend no treatment. In the case of regeneration prescriptions, stands generally will not reproduce without the recommended treatment.

Forester's Recommendation 216:

- Summer 2018 (or earlier depending on funding): Herbicide all invasive and competing plants under 12' height
- 2018: Construct deer enclosure fence
- 2019: First Stage Regeneration Harvest (shelterwood system) creating slightly more than 50% light to the forest floor, approximately 50% volume and value removal
- 2023 or 2024: Once desirable regeneration is sufficient, Second State Regeneration Harvest (overstory removal) with a residual basal area target of 10-20 square feet per acre – leaving wildlife-friendly species with optimum size and condition

402:

Description 402:

(From Silvah Report) Stand 402 is a 119 acre Oak-hardwoods forest. This transition stand is dominated by Yellow-poplar, Sugar Maple, Red Maple, Chestnut Oak, Hickory, Red Oak, Misc Comm. Species, White Ash, Non Comm. Species and White Oak which together comprise 89 percent of the basal area. This is a medium sawtimber stand, with average medial diameter of 16.3 inches. Thinning to provide more growing space for the better stems is desirable if it will at least pay the cost of harvesting. Total growing stock amounts to 128 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 31.8 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 20.1 cords of pulpwood and 6846.2 board feet of sawtimber (Scribner log rule). Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand. Undesirable understory plants may interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense fern cover and dense grass cover.

Silvicultural Prescription 402:

(From Silvah Report) SILVAH has recommended a Commercial Thinning. The stand is not yet mature (6 years to maturity) and the user does not wish to begin regeneration now. The stand will not be fully mature for another 6 years, but there is enough volume for a Commercial Thinning. The stand is getting close to maturity and a Regeneration Establishment treatment can be considered by changing the Start regeneration now option to "Yes- regardless of conditions". Stands at or above 80 percent relative density should generally receive a commercial thinning at this time. In calculating the cut and residual stands, attempt to reduce relative stand density to 60 percent, but do not remove more than 35 percent of the stocking in any one cut. The cutting should be concentrated in the smaller, merchantable-size trees. Some larger trees should also be cut to open the canopy, improve spacing, and remove unacceptable growing stock. No non-merchantable saplings need to be cut. This type of thinning should tend to narrow the range of diameters and mold the stand structure (of the merchantable-size trees) into a more pronounced bell-shaped distribution. A commercial thinning should increase stand diameter and reduce the time required for the larger and better quality trees to reach maturity. They should also increase the proportion of the most valuable species, and improve the average stand quality by removing the poorer stems. Include some high-wildlife value species (yellow poplar, sugar maple, chestnut oak, northern red oak, blackgum, white oak, American basswood, black oak, ironwood, black locust, white pine, cucumber-tree, Virginia pine and eastern hemlock) for retention in the thinning and TSI. Begin to identify islands of vertical structure for final overstory removal. A pulpwood only sale will yield 8 cords.

Warnings

- The merchantable medial diameter (17.0) is just below the 18 inch decision point in Chart A; the stand may be mature.
- The stand is close to maturity (6 years), consider changing the Start regeneration now option to "Yes- regardless of conditions" to see Regeneration Establishment treatments.

Additional treatment

- This stand has 43.8 percent of the understory plots stocked with grapevines. Grapevines that grow into the crowns of trees can cause extensive damage by interfering with growth and seed production, and by breaking out the tops of the trees. Damage can be especially severe in young, even-aged stands. In stands with more than 30 percent of the understory plots stocked with grapevines, it is usually advisable to treat the vines. This can be done by cutting the vines close to the ground. Canopy shade will usually prevent the sprouts from surviving. Where canopy density is low, or where harvest cutting will occur within a few years, cut the vines and treat the cut stumps with an herbicide.

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These prescriptions generally produce the desired results, requires an investment, and usually will yield an economic return at the same time. If such investment meets your organization's economic criteria, we recommend it. If not, we recommend no treatment. In the case of regeneration prescriptions, stands generally will not reproduce without the recommended treatment.

Yields

- The yield only passes the breakpoint for a pulpwood-only sale.
- An combined sawlog/pulpwood sale will yield 1342 bd.ft. (Scribner) and 7 cords.
- A sawlog-only sale will yield 1342 bd.ft. (Scribner)
- A pulpwood-only sale will yield 8 cords.

About 2% of the basal area harvested (36 sq.ft.) will be UGS. This will result in removal of about 50% of the UGS in this stand, and 100% of the merchantable-size UGS.

Cut Guides

Reduce relative stand density to 60%. Within the size and quality constraints below, favor the best trees wherever possible. Try to preserve seed sources of scarce species if they are desired in the regeneration, and strive for uniform spacing among residuals whenever possible. Cut most (>90%) of the trees in the pole size class. Cut 1 out of 3 trees in the small sawtimber size class.

Cut a few (<10%) of the trees in the medium sawtimber size class.

Leave Guides

Leave 92 sq.ft. of basal area per acre using the basal area distribution below.

Basal area distribution

Size class	Basal Area
(sq.ft./ac.)	
Saplings	7
Pole	0
Small sawtimber	31
Medium sawtimber	41
Large sawtimber	13

Forester's Recommendation 402:

- 2018 (or earlier depending on funding): herbicide (spot treatment) on 25 acres of high priority invasive and competing plants under 12' height. This will greatly improve future conditions.
- 2018: ash salvage harvest combined with Timber Stand Improvement (TSI) thinning across whole management unit – focusing on removal of less competitive trees and trees that have already or soon will reach their economic maturity. The purpose of a TSI harvest is to allow the best trees to reside after harvest and continue to grow. Remove approximately 20% of volume and value with TSI harvest

415:

Description 415

(From Silvah Report) Stand 415 is a 118 acre Mixed Oak forest. This mixed oak stand is dominated by White Oak, Red Oak, Red Maple, Yellow-poplar, Sugar Maple, Black Birch, Hemlock, Pine, White Ash, White Pine and Black Cherry which together comprise 90 percent of the basal area. This is a medium sawtimber stand, with average medial diameter of 16.5 inches. Thinning to provide more growing space for the better stems is desirable if it will at least pay the cost of harvesting. Total growing stock amounts to 120 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 29.0 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 17.6 cords of pulp wood and 6674.1 board feet of sawtimber (Scribner log rule). Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Non-commercial saplings and poles represent 6 sq. ft. of basal area and may need to be treated prior to final harvest cutting. Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand. Undesirable understory plants may interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense tall woody cover, dense fern cover and dense grass cover.

Silvicultural Prescription 415:

(From Silvah Report) SILVAH has recommended a Defer Cutting (low volume).

The stand is not yet mature (6 years to maturity) and the user does not wish to begin regeneration now. Saplings are not a major stand component (5.0 sq.ft.). There is not enough volume for a commercial sale. Defer any cutting and re-examine the stand in about 10 or 15 years.

Warnings

- The merchantable medial diameter (17.0) is just below the 18 inch decision point in Chart A; the stand may be mature.

Forester Recommendations 415:

- 2018 (or earlier depending on funding): herbicide (spot treatment) on 25 acres of high priority invasive and competing plants under 12' height. This will greatly improve future conditions.

- 2018: Crop Tree Release (CTR) thinning designed to give the best trees more room to expand their crowns and grow. Remove approximately 25% of the volume and value of the current stand with CTR - focusing on removal of trees in direct competition with better trees. Advised is a low-intensity CTR thinning – with a 1 or 2 side release format.

403:

Description 403:

(From Silvah Report) Stand 403 is a 199 acre Oak-hardwoods forest. This mixed oak stand is dominated by Chestnut Oak, Red Maple, Misc Comm. Species, Red Oak, Hickory, White Oak, Black Oak, Cucumber and White Pine which together comprise 89 percent of the basal area.

This is a medium sawtimber stand, with average medial diameter of 14.5 inches. Thinning to provide more growing space for the better stems is desirable if it will at least pay the cost of harvesting. Total growing stock amounts to 120 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 27.4 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 19.5 cords of pulp wood and 4637.9 board feet of sawtimber (Scribner log rule). Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Non-commercial saplings and poles represent 6 sq. ft. of basal area and may need to be treated prior to final harvest cutting. Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand. Undesirable understory plants may interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense tall woody cover, dense fern cover and dense grass cover.

Silvicultural Prescription 403:

(From Silvah Report) SILVAH has recommended a Commercial Thinning.

The stand is not yet mature (16 years to maturity) and the user does not wish to begin regeneration now. The stand will not be fully mature for another 16 years, but there is enough volume for a Commercial Thinning. Stands at or above 80 percent relative density should generally receive a commercial thinning at this time. In calculating the cut and residual stands, attempt to reduce relative stand density to 60 percent, but do not remove more than 35 percent of the stocking in any one cut. The cutting should be concentrated in the smaller, merchantable-size trees. Some larger trees should also be cut to open the canopy, improve spacing, and remove unacceptable growing stock. No non-merchantable saplings need to be cut. This type of thinning should tend to narrow the range of diameters and mold the stand structure (of the merchantable-size trees) into a more pronounced bell-shaped distribution. A commercial thinning should increase stand diameter and reduce the time required for the larger and better quality trees to reach maturity. They should also increase the proportion of the most valuable species, and improve the average stand quality by removing the poorer stems. Include some high-wildlife value species (chestnut oak, blackgum, northern red oak, white oak, black oak, cucumber-tree, white pine, yellow poplar, sugar maple, sassafras, American beech, black locust, Virginia pine, aspen, serviceberry and witchhazel) for retention in the thinning and TSI. Begin to identify islands of vertical structure for final overstory removal. A pulpwood only sale will yield 7 cords.

Yields

- The yield only passes the breakpoint for a pulpwood-only sale.
- An combined sawlog/pulpwood sale will yield 1034 bd.ft. (Scribner) and 7 cords.

- A sawlog-only sale will yield 1034 bd.ft. (Scribner)
- A pulpwood-only sale will yield 7 cords.

About 6% of the basal area harvested (39 sq.ft.) will be UGS. This will result in removal of about 89% of the UGS in this stand, and 100% of the merchantable-size UGS.

Cut Guides

Reduce relative stand density to 60%. Within the size and quality constraints below, favor the best trees wherever possible. Try to preserve seed sources of scarce species if they are desired in the regeneration, and strive for uniform spacing among residuals whenever possible.

Cut most (>90%) of the trees in the pole size class.

Cut a few (<10%) of the trees in the small sawtimber size class.

Cut a few (<10%) of the trees in the large sawtimber size class.

Leave Guides

Leave 81 sq.ft. of basal area per acre using the basal area distribution below.

Basal area distribution

Size class	Basal Area
(sq.ft./ac.)	
Saplings	9
Pole	1
Small sawtimber	32
Medium sawtimber	25
Large sawtimber	14

Forester's Recommendation 403:

- Summer 2018 (or earlier, depending on funding): herbicide all competing and invasive plants under 12' height.
- 2018: Construct deer exclosure fence around entire management unit
- 2020-2022: Timber Stand Improvement (TSI) thinning across whole management unit – focusing on removal of less competitive trees and trees that have already or soon will reach their economic maturity. The purpose of a TSI harvest is to allow the best trees to reside after harvest and continue to grow. Remove approximately 20% of volume and value with TSI harvest

410:

Description 410:

(From Silvah Report) Stand 410 is a 139 acre Oak-hardwoods forest. This mixed oak stand is dominated by Red Maple, Chestnut Oak, White Oak, Misc Comm. Species, Yellow-poplar, Black Birch, Black Oak, Sugar Maple and Hickory which together comprise 89 percent of the basal area. This is a medium sawtimber stand, with average medial diameter of 15.8 inches. Thinning to provide more growing space for the better stems is desirable if it will at least pay the cost of harvesting. Total growing stock amounts to 124 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 29.7 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 20.9 cords of pulp wood and 5192.0 board feet of sawtimber (Scribner log rule). Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Non-commercial saplings and poles represent 10 sq. ft. of basal area and may need to be treated prior to final harvest cutting. Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand. Undesirable understory plants may interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense tall woody cover, dense fern cover and dense grass cover.

Silvicultural Prescription 410:

(From Silvah Report) SILVAH has recommended a Commercial Thinning. The stand is not yet mature (9 years to maturity) and the user does not wish to begin regeneration now. The stand will not be fully mature for another 9 years, but there is enough volume for a Commercial Thinning. The stand is getting close to maturity and a Regeneration Establishment treatment can be considered by changing the Start regeneration now option to "Yes- regardless of conditions". Stands at or above 80 percent relative density should generally receive a commercial thinning at this time. In calculating the cut and residual stands, attempt to reduce relative stand density to 60 percent, but do not remove more than 35 percent of the stocking in any one cut. The cutting should be concentrated in the smaller, merchantable-size trees. Some larger trees should also be cut to open the canopy, improve spacing, and remove unacceptable growing stock. No non-merchantable saplings need to be cut. This type of thinning should tend to narrow the range of diameters and mold the stand structure (of the merchantable-size trees) into a more pronounced bell-shaped distribution. A commercial thinning should increase stand diameter and reduce the time required for the larger and better quality trees to reach maturity. They should also increase the proportion of the most valuable species, and improve the average stand quality by removing the poorer stems. Include some high-wildlife value species (chestnut oak, white oak, blackgum, yellow poplar, black oak, sugar maple, American beech, northern red oak, cucumber-tree, black cherry, black locust, sassafras, ironwood and eastern hemlock) for retention in the thinning and TSI. Begin to identify islands of vertical structure for final overstory removal. A pulpwood only sale will yield 9 cords.

Warnings

- The stand is close to maturity (9 years), consider changing the Start regeneration now option to "Yes- regardless of conditions" to see Regeneration Establishment treatments.

Additional treatment

- This stand has 33.3 percent of the understory plots stocked with grapevines. Grapevines that grow into the crowns of trees can cause extensive damage by interfering with growth and seed production, and by breaking out the tops of the trees. Damage can be especially severe in young, even-aged stands. In stands with more than 30 percent of the understory plots stocked with grapevines, it is usually advisable to treat the vines. This can be done by cutting the vines close to the ground. Canopy shade will usually prevent the sprouts from

surviving. Where canopy density is low, or where harvest cutting will occur within a few years, cut the vines and treat the cut stumps with an herbicide.

These prescriptions generally produce the desired results, requires an investment, and usually will yield an economic return at the same time. If such investment meets your organization's economic criteria, we recommend it. If not, we recommend no treatment. In the case of regeneration prescriptions, stands generally will not reproduce without the recommended treatment.

Yields

- The yield only passes the breakpoint for a pulpwood-only sale.
- An combined sawlog/pulpwood sale will yield 1292 bd.ft. (Scribner) and 8 cords.
- A sawlog-only sale will yield 1292 bd.ft. (Scribner)
- A pulpwood-only sale will yield 9 cords.

About 8% of the basal area harvested (44 sq.ft.) will be UGS. This will result in removal of about 100% of the UGS in this stand, and 100% of the merchantable-size UGS.

Cut Guides

Reduce relative stand density to 61%. Within the size and quality constraints below, favor the best trees wherever possible. Try to preserve seed sources of scarce species if they are desired in the regeneration, and strive for uniform spacing among residuals whenever possible.

Cut most (>90%) of the trees in the pole size class.

Cut 1 out of 3 trees in the small sawtimber size class.

Cut a few (<10%) of the trees in the medium sawtimber size class.

Cut 1 out of 10 trees in the large sawtimber size class.

Leave Guides

Leave 80 sq.ft. of basal area per acre using the basal area distribution below.

Basal area distribution

Size class	Basal Area
(sq.ft./ac.)	
Saplings	7
Pole	2
Small sawtimber	20
Medium sawtimber	38
Large sawtimber	13

Forester's Recommendation 410:

- 2018: Timber Stand Improvement (TSI) thinning across whole management unit – focusing on removal of less competitive trees and trees that have already or soon will reach their economic maturity. The purpose of a TSI harvest is to allow the best trees to reside after harvest and continue to grow. Remove approximately 20% of volume and value with TSI harvest

411:

Description 411:

(From Silvah Report) Stand 411 is a 122 acre Oak-hardwoods forest. This mixed oak stand is dominated by Chestnut Oak, Yellow-poplar, Sugar Maple, Hickory, Red Oak, Red Maple, Black Oak and Cucumber which together comprise 90 percent of the basal area. This is a large sawtimber stand, with average medial diameter of 18.3 inches. Total growing stock amounts to 126 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 32.9 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 21.4 cords of pulp wood and 6814.4 board feet of sawtimber (Scribner log rule). Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand. Undesirable understory plants may interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense fern cover and dense grass cover.

Silvicultural Prescription 411:

(From Silvah Report) SILVAH has recommended a Shelterwood Seed Cut- herbicide.

Use a Two-cut Shelterwood sequence to increase competitive regeneration. The first (seed) cut should reduce relative stand density to 60 percent to provide for the establishment of a large number of additional advance seedlings, without allowing them to grow rapidly enough to become attractive to deer. The seed cut made now can be followed in 5 to 10 years by final overstory removal (assuming adequate competitive seedlings develop).

Warnings

- The merchantable medial diameter (18.6) is just above the 18 inch decision point in Chart A; the stand may not be mature.

Additional treatments

- Treat the undesirable understory plants with an application of herbicide during the appropriate part of the growing season. Herbicide is an effective, safe and economical technique for removing vegetation that interferes with establishment and growth of oak regeneration. There are five different application techniques for using herbicides to control interfering vegetation. Each is matched with a specific set of conditions where it will provide effective control. With all, be sure to follow all instructions on the herbicide label, wear appropriate safety clothing and equipment, and follow applicable laws with regard to herbicide applicator licensing. Please refer to the silvicultural guide for details about implementing this prescription.
- This stand has 73.7 percent of the understory plots stocked with grapevines. Grapevines that grow into the crowns of trees can cause extensive damage by interfering with growth and seed production, and by breaking out the tops of the trees. Damage can be especially

severe in young, even-aged stands. In stands with more than 30 percent of the understory plots stocked with grapevines, it is usually advisable to treat the vines. This can be done by cutting the vines close to the ground. Canopy shade will usually prevent the sprouts from surviving. Where canopy density is low, or where harvest cutting will occur within a few years, cut the vines and treat the cut stumps with an herbicide.

These prescriptions generally produce the desired results, requires an investment, and usually will yield an economic return at the same time. If such investment meets your organization's economic criteria, we recommend it. If not, we recommend no treatment. In the case of regeneration prescriptions, stands generally will not reproduce without the recommended treatment.

Yields

- A combined sawlog/pulpwood sale will yield 1413 bd.ft./ac. (Scribner) and 7 cords/ac.
- A sawlog-only sale will yield 1413 bd.ft./ac. (Scribner)
- A pulpwood-only sale will yield 9 cords/ac.

About 13% of the basal area harvested (37 sq.ft.) will be UGS. This will result in removal of about 100% of the UGS in this stand, and 100% of the merchantable-size UGS.

Cut Guides

Reduce relative stand density to 60%. Within the size and quality constraints below, favor the best trees wherever possible. Try to preserve seed sources of scarce species if they are desired in the regeneration, and strive for uniform spacing among residuals whenever possible.

Cut 4 out of 5 trees in the pole size class.

Cut 1 out of 3 trees in the small sawtimber size class.

Cut 1 out of 10 trees in the medium sawtimber size class.

Cut 1 out of 4 trees in the large sawtimber size class.

Leave Guides

Leave 89 sq.ft. of basal area per acre using the basal area distribution below.

Basal area distribution

Size class	Basal Area
(sq.ft./ac.)	
Saplings	3
Pole	4
Small sawtimber	22
Medium sawtimber	42
Large sawtimber	19

Forester's Recommendation 411:

- 2018: Timber Stand Improvement (TSI) thinning across whole management unit – focusing on removal of less competitive trees and trees that have already or soon will reach their economic maturity. The purpose of a TSI harvest is to allow the best trees to reside after harvest and continue to grow. Remove approximately 20% of volume and value with TSI harvest

414:

Description 414:

(From Silvah Report) Stand 414 is a 141 acre mixed oak forest. This mixed oak stand is dominated by White Oak, Chestnut Oak, Red Maple, Hemlock, Black Oak, Red Oak, Hickory, White Pine, Black Birch and Sugar Maple which together comprise 89 percent of the basal area.

This is a medium sawtimber stand, with average medial diameter of 16.3 inches. Thinning to provide more growing space for the better stems is not necessary at this time. Total growing stock amounts to 100 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 24.8 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 16.7 cords of pulp wood and 4684.1 board feet of sawtimber (Scribner log rule). Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand. Undesirable understory plants may interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense tall woody cover, dense fern cover and dense grass cover.

Silvicultural Prescription 414:

(From Silvah Report) SILVAH has recommended a Site Prep. Burn or Herbicide, Monitor Acorns, Re-inventory. Seedlings are too scarce at this time. Wait for an acorn crop and re-inventory 2-5 years later. This prescription is appropriate for stands that are between large acorn crops and not affected by deer, or shade, but interfering vegetation is a problem. Such stands have an adequate seed source but are lacking oak regeneration. The Deer Impact Index is 3 or less, stocking of interfering vegetation is greater than 30 percent, and stocking of thick duff is 30 percent or less. These stands need time for an acorn crop to occur and for subsequent seedling establishment so it is best not to intervene at this time. Either a site preparation burn or application of herbicide is required to control interfering vegetation. If using fire, conduct one or more burns according to instructions in the Site Prep Burn description. If applying herbicide, use one or more of the methods described in the Herbicide description. Monitor acorn crops and inventory the stand 2 to 5 years after a good acorn crop has established a cohort of new oak seedlings to determine the next treatment.

Additional treatment

- Apply a site-prep burn when conditions are appropriate, or treat the undesirable understory plants with an application of herbicide during the appropriate part of the growing season. This type of prescribed fire prepares an oak stand for eventual oak seedling establishment after a future acorn crop. The objective is to reduce dense understory shade and litter loadings so that a larger proportion of an acorn crop successfully germinates and becomes seedlings. Burning can be done in the dormant season (fall or early spring) or growing season (late spring) and at any intensity. However, high-intensity fires (flame lengths greater than 2 feet) in the late spring decrease dense understory shade more quickly than low intensity fires in the fall or early spring. Generally, multiple fires spread over several years are necessary to

reduce dense understory shade to a level that improves the survival and growth of new oak seedlings. Do not burn if an acorn crop has just fallen or if new oak seedlings from a recent acorn crop are needed to help regenerate the stand as fire kills acorns and small oak seedlings (Auchmoody and Smith 1993). Please refer to the silvicultural guide for details about implementing this prescription.

These prescriptions generally produce the desired results, requires an investment, and usually will yield an economic return at the same time. If such investment meets your organization's economic criteria, we recommend it. If not, we recommend no treatment. In the case of regeneration prescriptions, stands generally will not reproduce without the recommended treatment.

Forester's Recommendation:

- 2018 (or earlier depending on PGC cooperation and schedule): Conduct a 25-50 acre Controlled Burn Pilot Project. The purpose of prescribing fire in this unit is two-fold. First, fire is a tool to control competing/invasive plants as well as invigorate native plants. Second, if proven successful, and if desirable by ECWC, this controlled burn pilot project can be used to promote the idea of utilizing fire on the ECWC property in other locations in the future. This project will necessitate full cooperation with Pennsylvania Game Commission.

Forest Management Action Plan:

Priority Mgt Units	A creage	Y ear	Recommended Activity
216	1 04.2	2 018	herbicide invasive and competing plants
		2 018	install deer exclosure fence
		2 019	shelterwood regeneration harvest
		2 023/24	overstory removal harvest
402	1	2	ash salvage & timber stand

	18.8	018	improvement thinning
	2 5	2 018	herbicide spot treatment on inv and comp plants
415	1 13.4	2 018	crop tree release thinning
		2 018	herbicide spot treatment on inv and comp plants
403	1 96.6	2 018	herbicide invasive and competing plants
		2 018	install deer exclosure fence
		2 020-22	timber stand improvement thinning
410	1 38.7	2 018	timber stand improvement thinning
411	1 21.8	2 018	timber stand improvement thinning
414	2 5-50	2 018	Controlled Burn Pilot Project on a portion of 141.3 ac

Cost/Benefit Analysis (with Alternatives) for Each Priority Management Unit:

Priority Mgt Units	Acreage	Year	Recommended Activity	Approx Cost	Approx Benefit
216	104.2	2018	herbicide invasive and competing plants	23400	
		2018	install deer exclosure fence	30000	
		2019	shelterwood regeneration harvest		65000
		2023/24	overstory removal harvest		65000
402	118.8	2018	ash salvage & timber stand improvement thinning		25960
	25	2018	herbicide spot treatment on inv and comp plants	5625	
415	113.4	2018	crop tree release thinning		39550
		2018	herbicide spot treatment on inv and comp plants	5625	
403	196.6	2018	herbicide invasive and competing plants	44100	
		2018	install deer exclosure fence	35000	
		2020-22	timber stand improvement thinning		35280
410	138.7	2018	timber stand improvement thinning		27600
411	121.8	2018	timber stand improvement thinning		31668
414	25-50	2018	Controlled Burn Pilot Project on a portion of 141.3 ac	0	
				143750	290058

Blue = hopeful for cooperation and funding by PGC

Yellow = approx. deer fencing costs – bids required

Red = See alternatives for shifting year of project

All figures presented are approximate and based largely on provided forest data and current market conditions

	Net Financial Outcomes by Year								total
	2017	2018	2019	2020	2021	2022	2023	2024	
	0	-18972	65000	35280	0	0	65000	0	146308
	Net Financial Outcome by Stand #								
	216	402	415	403	410	411	414		
	76600	20335	33925	-43820	27600	31668	0		146308
	Alternate A (backing up 403 projects one year)								
	Net Financial Outcomes by Year								total
	2017	2018	2019	2020	2021	2022	2023	2024	
	0	60128	-14100	0	35280	0	65000	0	146308
running	0	60128	46028	46028	81308	81308	146308	146308	146308
	Alternate B (with full PGC involvement - covering herbicide and prescribed fire expenses)								
	Net Financial Outcomes by Year								total
	2017	2018	2019	2020	2021	2022	2023	2024	
	0	59778	65000	35280	0	0	65000	0	225058

Tan = Be sure to discuss this total benefit – a portion should be seen as a “starter” for future forest planning and management practices designed to improve the forest.
All figures are approximate and based largely on provided forest data and current market conditions

NOTES:

1. Marketing forest products is a complicated process and should not be entered into lightly. We look forward to discussing timber marketing options with you.
2. Deer enclosure fencing area discussed in this plan may have to be altered due to terrain, riparian zones, access, etc.
3. Large, beautiful properties like ECWC should budget for annual herbicide “mop up” following large-scale herbicide projects.
4. Become vigilant with harvesting deer and attacking invasive plants – these will be key to future forestry success.

5. Follow this Forest Management Action Plan (FMAP) up to approximately 2024. Other stands/management units can be added to this FMAP at any time. Prior to 2024, a new FMAP should be developed that will both continue good work and advise new projects that will make the ECWC forest better and meet all the goals of the ECWC.